GAS JOURNAL

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THE WASTE HEAT TURBINE

THE West Midlands Gas Board is certainly to be congratulated on its public spirit. First we have its support and encouragement in putting down full scale plant to try out the ideas brought to a head by Dr. F. J. Dent and his associates at Bournemouth; and now we have the sponsoring of the venture at Coventry with Captain W. Gregson's scheme for the application of gas turbine technique to the recovery of waste heat from a retort bench—a venture which could only be given a fair trial at full scale in connection with a large installation. The scheme had already at vesting date been worked out in collaboration between Captain Gregson and the firms of John Brown & Co. and West's Gas Improvement Company at the instance of Mr. J. E. Wakeford. The motive of the West Midlands Gas Board, as Mr. G. le B. Diamond so modestly put it, was simply that they 'decided that it would be in the national interest for it to proceed.'

The so-called gas turbine is always more or less a hot-air turbine. In the usual oil-fired set, for instance, air is heated to the limiting working temperature of the turbine blade by the internal combustion of oil. A substantial fraction of the power generated is absorbed in raising the hot mixture of air and products of combustion to the necessary initial pressure. The thermal efficiency of the simple cycle is not very high. It can be raised to a figure equal to the steam combination by much complication.

In the application of the gas turbine to the recovery of waste heat the air is heated externally by the waste gases from the settings. In essence that is the only difference. But the difference between the gas turbine and the steam scheme runs on other lines. Here we have the place of the boiler taken by an air heater and the working fluid is changed from high pressure steam to pressurised hot air. In both cases the net power available is reduced by the power consumption of auxiliaries. The gas turbine scheme requires a much higher proportion of auxiliary power though it still leaves considerable energy recoverable in a following waste heat boiler. The net result is an important increase in power available in favour of the gas turbine. The use and distribution of this increased power in the gasworks economy has still to be worked out. And there will be problems in the handling of very large volumes of cooling water.

Captain Gregson's paper is a model of concise, objective statement. Never once does he stray into pious hopes or personal prejudice. The case for the pressurised closed cycle comes out all the stronger. We are left wondering how anyone can doubt it. The discussion brought out most of the points which arise in the consideration of so novel a project. Mr. J. B. Bucher crystallised in a happy phrase just what the gas industry expects of any form of waste heat recovery: 'The primary job in the life of the gas engineer is to produce gas, not to fiddle with gas turbines.' We are assured by the designers that the Coventry installation will be a model of control and automaticity. Certainly never in the history of gas-making have devices of so much complexity been set up in the retort house as those now to be applied to the two principal systems of continuous vertical retorts.

Most of the discussion time was taken up by the advocates of the several systems. There was indeed a pleasant air of collaboration both in the paper and in the discussion between the several competitors for the favour of the gas industry. It was left to Mr. M. Redman, apart from Mr. Diamond's masterly introduction, to put the case of the gas engineer. The effect of a possible severe retort leakage is a point that we hope the author will deal with in his written reply. Gases should not normally leave the top of a well-designed continuous vertical retort setting at temperatures in excess of 950°C.

But the most important aspect of these interesting adventures upon which the gas industry and its

designers have embarked is that, whereas the 'straight steam' method of waste heat recovery has practically exhausted its possibilities, the gas turbine, already attractive, has its future possibilities in front of it. Some of these are affected by the limiting working temperature of the alloy steel of the turbine blade. Mr. A. W. Pope promises that the present 650°C. already advanced to 750°C. may be further improved upon at least by an increased mechanical strength. It would be interesting to know just what this cryptic name 'nimonic' stands for—presumably a nickel alloy of some sort. We wonder whether there are possibilities with silicon and aluminium.

What the gas engineer ultimately expects and may hope for is summed up in the paper: 'Long availability, low maintenance costs, and an all-in installation cost comparing favourably with orthodox present-day steam practice.'

A STRAW TOO MANY

ANNOUNCEMENT on a later page of today's issue of the *Gas Journal* of the move of the headquarters group of Ascot Gas Water Heaters, Ltd., from 43, Park Lane to the offices and factory at Neasden focuses attention once again on the cruel burden which the manufacturers of gas water heaters have been called upon to shoulder not only through purchase tax but—and even more deadening in effect—through restrictions on hire purchase. It is not that Ascot is not determined to weather the storm or in any way to diminish the service facilities which form such an important and helpful feature of the firm's activities. Far from it. But facts have to be faced and nettles have to be grasped. The situation in the water heater field is serious and, if there is no alleviation of taxation and restriction, will become more so. As far as Ascot is concerned, the firm's policy in regard to quality and price and the continuance of research and development in the field remains unchanged. At Neasden the works have in fact been extended by 12,000 sq. ft. and plans have been made for carrying out, by the creation of a new section, production of another character in light engineering. When the present sorry general position alters Ascot will be able to meet at the instant any demands in the manufacture of water heaters.

The facts about water heater demand at the moment are far from palatable. The number of manufacturers is now reduced to less than ten. We have before us information relating to seven of these firms, and the output of the remainder accounts for less than 5% of the total trade. One of the firms whose information is included in the figures we are about to quote is already in voluntary liquidation—sufficient evidence of the effect of the restrictions on the gas water heater industry. Let us take a glance at the incidence of the Hire Purchase and Credit Sale Agreements (Control) Order, 1952, which came into operation on February 1 of last year. In January of 1952 orders for gas water heaters for the seven firms to which the figures apply —and which obviously present the picture in right perspective—amounted to 20.400. Decline in demand set in in February and throughout the months of the year the gradient of decline steepened. By October, total orders were 8,000. And what about the export business in hardening markets? To get this business manufacturers have to incorporate modifications to the home trade heaters and are thereby handicapped in recovery of the cost of export heaters. What we would emphasise in this respect is that the reduction in the home trade has been such that, unless there is relief in the last-straw burdens now on the water heater industry's back, the manufacturers can hardly be expected to sustain enthusiasm in seeking export business. Will the barriers be raised in this year of Coronation?

THE ISOLATED SMALL WORKS

INTEGRATION as a means of reducing the cost of gas supply in small districts breaks down in the isolated districts too far from larger works for economical transmission. Dr. E. Johnson's account at the Institution research meeting of the full scale trial at Spenborough of the manufacture of butane-enriched blue water-gas to meet such cases opened with a general examination of the several alternatives. To achieve success, apart from general low cost, the gas produced must be suitable for distribution in the existing system and for utilisation in existing appliances with little or no modification. We take it that even the system selected for investigation at Spenborough would only be applied where existing plant was obsolete, requiring complete replacement.

Briefly, the distribution of neat liquified petroleum gases was ruled out by their high specific gravity and radically different combustion characteristics, oil gas plant because of similar defects in the gas produced (though Mr. R. J. Thompson from his French experience reported that in later designs of the G.E.I.M. plant these defects have been removed to a great extent), the usual small complete gasification plant because of low calorific value and high specific gravity, blue water gas alone because it obviously required enrichment, carburetted water gas because of its relatively high cost, enrichment with benzole because of difficulty with calorific value attainment and control, and with aviation spirit for pretty obvious reasons of cost and availability. This analysis left cold enrichment of blue water gas with butane.

The omission of reference to the interesting butane-air installation in Wales is excused by lack of knowledge at the time when the paper was written. Propane-air is extensively used in small works in France and there is even one instance of a small township re-piped for the distribution of unmixed propane in appliances completely renewed for its use. Mr. D. N. McGaskill thought there was still a case for the small up-to-date vertical retort plant—on the curious ground, apart from its relative economy, that it might have some effect on employment. Such plants are working successfully in works producing as low as 15 mill. cu.ft. per annum, and they do contribute to the demand for coke which is not met by any of the alternatives considered.

Some interesting points were brought out in the excellent discussion of this paper. The representative of the oil refinery industry reminded us that we must not regard these gases as waste products—though some of us have seen them burning to waste. At any rate one would think that the extension of oil refinery in this country will lead to profitable negotiations between the two industries for the use of tail gases in one or other of the ways mentioned in the paper. Mr. Thompson's contribution to the discussion was, as we have noted above, informed with his experience in France where a great deal of practical work has been done in the use of petroleum products by Gaz de France. One of the results of this work is the evolution of the Delbourg 'combustion potential' formula which Dr. Johnson himself applied with success. Both Mr. Thompson and Mr. Wright (from his experience at Whitland) dispelled the idea that the presence of free oxygen in the gas distributed need give rise to serious difficulty. Mr. W. T. Hird confirmed this, also from the experience at Whitland, and contributed the further point that the low sulphur content of these mixtures is an attractive feature.

Dr. Johnson's conclusions would seem to apply equally well to both the butane-air and the butane-water gas mixtures except perhaps there was a little more adjustment of appliances at Whitland. But the final conclusion must be that of Mr. Hird, who emphasised that what was important was that knowledge and experience of all possible methods of using these gases should be obtained. Only then will decision be possible about the best procedure to follow in each particular case.

ANOTHER CENTENARY NUMBER

On November 26, 1852, appeared the first number of the *Journal of the Royal Society of Arts*, a modest publication designed, in the words of its creator, 'to record all the Society's proceedings, serve as a medium of communication between the Society and the allied institutions, and form a permanent record of the progress of science, art, and industry.' Its object was achieved, and the proof is to be found in the issue of November 28, 1952. This Centenary issue bears witness to the success of the policy which has governed the journal during its hundred crowded years and in itself provides a fascinating record of artistic taste during this period. Although somewhat dull in appearance—judged by present-day standards, that is—the first number contained such ambitious features as Union Correspondence, Foreign Correspondence, and Colonial Correspondence, as well as a Question Box and the Chairman's address. By the third issue editorial confidence became sufficiently strong to publish the remarkable statement: 'Several members of the Society have complained of not receiving the *Journal*. In every case, however, it has been found that the blame really rested with the members' servants.' Through the years the *Journal* mirrored many of the major engineering feats and some of these are recorded in the Centenary number, ranging from Edison's improved phonograph to the Forth Bridge. Illustrations include the Beaumont compressed air engine for tramways, and a remarkable electric radiator which appeared in 1895. Our favourite, however, is a device designed for communication between the guard and driver of a railway train. This proposes that a whistling bolt or arrow, without feathers, should be shot from a steel cross-bow by the guard of the train, a few yards in a direct line over the head of the engine driver, who should have a shield or a screen behind, reaching a foot above his head. The guard could place the bow on the roof of the carriage in his front—in a position marked out, so that every shot would follow the same track, without the necessity of raising the bow to his shoulder or taking any aim.

THE SCOTS POUND

Meagre information elicited by a recent question in the House of Commons on a reference in the Income Tax Act, 1952, to the 'Scots pound' prompted some research by Mr. W. F. Curtis, late Senior Principal Inspector of Taxes, the outcome of which is an interesting article in the *Income Tax Payer*, official quarterly journal of the Income Tax Payers' Society. It appears that before the Act of Union 245 years ago the Scots penny was called a 'schillin' and there was a Scots coin called a 'pund,' worth about one-twelfth of the English pound. The last coins struck in Scotland were in 1707 when, however, the old manner of accounting was retained, but (to quote a contemporary writer) 'these being now merely nominal, and no such really existing, all their sums of every denomination are esteemed equivalent to the twelfth part of the same English, as indeed they were when the two kingdoms were united by James I of Great Britain.'

The reason for referring to the 1s. 8d. Scots pound in the 1952 Act is that it is merely a consolidating Act. It could not change the law in any way, and accordingly it incorporated all enactments still in force, however out of date they might be. Amending legislation may appear in due time, in which case the reference to the 'pound (Scots)' will appear no more.

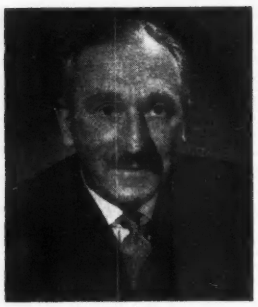
PROCEEDINGS OF THE A.G.I.

The Transactions of the Australian Gas Institute for 1951, a copy of which we have just received, records a session of varied and sustained interest under the presidency of Dr. R. S. Andrews, then Chief Technical Officer of the Gas and Fuel Corporation of Victoria and, since the beginning of 1952, the chairman of that body. Glancing through the pages of this 'omnibus' volume of reports, we were particularly struck by a novel feature of the Southern Sectional meeting in May, whereat one day was devoted to what we might term a 'free-for-all' discussion on matters relating to the small undertaking. The spontaneous and unrehearsed remarks covered a wide field, including automatic control of C.V., cleaning of gas mains, labour problems, and effluent disposal, and were refreshing in their forthright comments and suggestions. Some interesting experiences were given on the use of galvanised iron gas pipes and their resistance to corrosion. A noteworthy contribution to the proceedings of the annual general meeting and conference at Melbourne in November was the paper by Dr. Harold Hartley, Chairman of Radiation Ltd., on 'Gas Utilisation in the Domestic Sphere,' extracts from which we published in the *Journal* of February 13 last. The paper contained a fascinating illustrated section on the evolution of the gas fire from the earliest 'tea-cosy' model, through the fantastically ornate designs of the late 19th century to the modern type of radiant *cum* convector appliance. Dr. Hartley's paper, with its appendices, occupies over 60 pages of the Transactions and is followed by some 16 pages of discussion, which indicate the degree of interest aroused in Australia by this contribution from a past-president of our own Institution.

Personal

NEW YEAR HONOURS

Colonel Harold Charles Smith, C.B.E., Chairman of the Gas Council, received the distinction of Ordinary Knight Commander of the Civil Division of the Most Excellent Order of the British Empire (K.B.E.) in the New Year Honours list published last Thursday. He thus received 12 months after his appointment as Chairman of the Gas Council a similar honour to that conferred on Sir Edgar Sylvester, the first Chairman, in the Birthday Honours of 1949, a few weeks after the nationalisation of the gas industry. Colonel Smith started his career in the industry with the City of Birmingham Gas Department in 1906 and joined the Tottenham and District Gas Company in 1920 as works superintendent. He succeeded the late Mr. A. E. Broadberry as Chief Engineer in 1922, was appointed additionally as General Manager in 1943, and was Deputy Chairman and Managing Director of the Company from 1946 until vesting day. He was President of the Institution of Gas Engineers in 1937, and was Chairman of the British Gas Council from 1947 until it was vested in the Gas Council in 1949.



Sir Clive L. Baillieu, President of the Society of British Gas Industries, was created a Baron, as also was **Lord Eustace Percy,** a past President of the S.B.G.I.

Dr. H. Roxbee Cox, Chief Scientist, Ministry of Fuel and Power, received a Knighthood; as also did Mr. C. K. F. Hague, Deputy Chairman of Babcock and Wilcox, Ltd., and Deputy Chairman of the Royal Ordnance Factories Board.

The Earl of Limerick, Chairman of the Council of the Territorial and Auxiliary Forces Association, and Chairman of Ascot Gas Water Heaters, Ltd., was created a G.B.E.

Dr. W. H. Glanville, C.B.E., Director of the Road Research Laboratory of the D.S.I.R., became a C.B.

Lieut.-Colonel F. J. Bywater, M.C., Chairman of the Council for Codes of Practice for Buildings, Construction, and Engineering, and a past President of the former Southern Association of Gas Engineers and Managers, was appointed a C.B.E. **Alderman J. W. Moore,** Chairman of the Southern Gas Consultative Council, also received the C.B.E. 'for political and public services in Bournemouth.' **Mr. Harry Johnston,** Chief Engineer, North Eastern Gas Board, received the O.B.E.; and **Mr. T. D. Olver,** Production Engineer, Manchester group, North Western Gas Board, and **Mr. C. T. Price,** M.C., Divisional Engineer, East Surrey division, South Eastern Gas Board, each received the M.B.E.

The award of the British Empire Medal (Civil Division) to the following eight members of the gas industry was also announced: W. T. Booth (labourer, Beckton, North Thames); F. H. Feltwell (district inspector, Birmingham, West Midlands); H. R. Gray (foreman fitter, Sunderland division, Northern); T. Henderson (general foreman, Kelty, Scottish); F. Lloyd (works foreman, Wrexham, Wales); W. J. Potter (general foreman, Ramsgate, South Eastern); A. Scott (mainlaying inspector, Nottingham, East Midlands); and H. White (chargehand, Wakefield, North Eastern).

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Mr. S. L. Pleasance, A.S.A.A., previously Secretary of Ascot Gas Water Heaters, Ltd., has been elected to the Board of that company, and **Mr. J. Mackie,** A.C.I.S., has been appointed as Secretary.

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Mr. H. H. Harper, A.M.BRIT.I.R.E., has been appointed area sales representative of Evershed & Vignoles, Ltd., for South Wales and South West England. He has been associated with the electronic and light current industries since 1934, and joined the company in 1948 as a general technical sales representative. Mr. Harper takes up his duties this month following the retirement of **Mr. S. B. Haslam,** who has been the company's agent in South Wales for many years.

Mr. C. M. Langley, a nephew of **Mr. F. A. Langley,** founder of Stelcon (Industrial Floors), Ltd., has joined the Board of the company.

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Mr. F. W. King and **Mr. R. D. Gaskin** have been appointed to the board of Smith Meters, Ltd. Both new appointments are the reward of many years of loyal service. Mr. King joined the firm straight from school and when the Streatham Works was opened in 1928 took the position of Works Manager. Mr. Gaskin joins his father, Mr. Richard Gaskin, on the Board. He also has spent the whole of his business life with Smith Meters at the Kennington works.

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Mr. B. C. Westall, Chairman of Thomas De La Rue and Co., has asked to be relieved of his duties as Managing Director. The Board, in accepting the suggestion, asked that Mr. Westall should continue to occupy the chair. This he has agreed to do. His resignation as Managing Director came into effect as from January 1. **Mr. A. G. Norman,** who has been with the company for 18 years, has been appointed as Managing Director in his place. Last May Mr. Westall assumed responsibility for the management of De La Rue's industrial division. Since then he has conducted a review of the plastics and gas groups, as a result of which a reorganisation has been carried out and substantial economies effected. Mr. Westall says he feels, however, that the burden of this heavy executive work should now fall on younger shoulders. In his 30 years of service, 21 have been spent as Managing Director.

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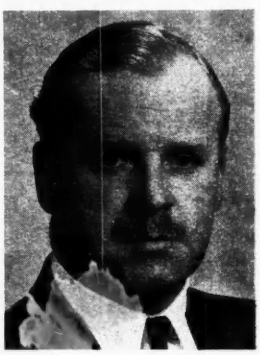
Alderman Darrell W. Rees, M.B.E., Deputy Chairman of the Pembrokeshire group of undertakings of the Wales Gas Board and Engineer and Manager of the Pembroke undertaking, has been nominated as the Coronation Mayor of the ancient borough of Pembroke. He will, in fact, be the 574th holder of that important office, while being one of the youngest in age. Alderman Rees has been a member of the Council for nine years, and was awarded the M.B.E. for his outstanding work during the blitz on Pembroke Dock. At the Council meeting at which he was unanimously elected as prospective Mayor warm tribute was paid to the fine public services rendered by both Alderman and Mrs. Rees, both of whom are natives of Neath.



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Mr. H. T. Seymour, formerly Accountant to the National Gas Council, took up an appointment as Accountant and Officer Manager on December 1 with E. W. Avent, Ltd., Civil Engineering Contractors, New Malden. He was for some years Accountant to Whittaker Ellis, Ltd., but relinquished that post in June, 1950, when the head office administration was removed from London to Birmingham. Educated at Emanuel School, Mr. Seymour joined the Gas Light and Coke Company in 1915, and on the reconstitution of the National Gas Council in 1919 took charge of the accounts, being later appointed Accountant to the Council. He was also responsible for the accounts of the associations formed under the auspices of the Council—the British Road Tar Association, Conjoint Conference of Public Utility Associations, British Gas Federation, and National Joint Industrial Council for the Gas Industry. In 1930 his book on the Principles and Practice of the Assessment of Gas Undertakings for Imperial and Local Taxation was published by Walter King, Ltd., at the *Journal* office, and to a Supplement issued two years later, Mr. H. E. Ibbs (then Chief Accountant to the Gas Light and Coke Company) wrote an 'Introduction.' A revised edition of this work was in active preparation at the outbreak of war. Mr. Seymour for many years contributed the annual 'Taxation Notes' section of the *Gas Journal Calendar and Directory,* and the review of case and statute law as affecting water supply undertakings in the Water Engineers' Handbook, as well as writing on income tax and rating matters for accountancy and technical journals.

Mr. and Mrs. Arthur Norman, of Ilfracombe, recently celebrated their golden wedding anniversary. Mr. Norman was in the administrative department of the Ilfracombe Gas Company for 50 years, and retired in 1935.

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Mr. J. R. W. Alexander, Executive Chairman, Gas Officers Guild, completed a busy year as President of the Chartered Institute of Secretaries on December 31. During his period of office, Mr. Alexander attended many functions of the Institute in England, Scotland, Wales, Ulster, and Eire, giving addresses on the economic and financial position of the country, the four essentials of the professional man, and conciliation and arbitration in industrial disputes.

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Mr. Harry Teasdale, B.SC., Vice-Chairman of the Membership Committee and member of the Education Committee of the Institution of Production Engineers, has taken up his duties as Training and Education Officer of the North Western Gas Board. Trained as a physicist and subsequently as a teacher, he has carried out post-graduate research in experimental Educational Psychology, and is the author of a text book on electro-technology. Since 1948 he has been principal of the Bristol Aeroplane Company's technical school.

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Mr. T. P. Reay has been appointed Southern area sales Manager of Cannon (Holdings), Ltd., and will control the company's representation in the North Thames, South Eastern, Southern, and Eastern areas. **Mr. L. N. Wilkes** has been appointed Midlands area Sales Manager for the East Midlands, West Midlands, and South Western areas. **Mr. G. I. Hoatson** has been appointed Northern area Sales Manager and will represent the company in the North Western, North Eastern, and Northern areas.

Mr. A. O. Russell, Director of Radiation (Large Cooking Equipment) Ltd., is now responsible for the selling activities of that organisation which have been taken over by Radiation Group Sales, Ltd., Large Apparatus Division. **Mr. L. Clare** continues as London Manager, and the divisional office organisation at Warrington has been taken over by **Mr. H. K. Taylor,** who for many years has been associated with the sales activities of Richmonds Gas Stove Co., Ltd.

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Mr. J. R. Walker, Director of Fletcher, Russell & Co., Ltd., and Radiation (Large Cooking Equipment) Ltd., has retired. He joined Fletcher, Russell & Co., Ltd., in 1920 as a trainee under the disabled ex-Servicemen's training scheme. He later became personal assistant assistant to the Managing Director and was appointed a Director of Fletcher, Russell & Co., Ltd., in 1937. He took a great interest in the development of large apparatus, and it was a natural sequence that he became a Director of Radiation (Large Cooking Equipment) Ltd., on the formation of that company, and in charge of its activities at Warrington since that date.

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Mr. G. E. Hall, M.SC., A.R.I.C., has been appointed Chief Technical Officer to the British Coking Industry Association. He has been connected with the coking industry since taking his degree in Gas Engineering at the University of Leeds in 1934, where he held the first Cartwright Holmes Scholarship in Gas Engineering. He joined the coke oven erection department of Simon Carves and later went to Dorman Long & Co., Ltd. He has served as a principal scientific officer with the British Coke Research Association, specialising in the problems of coal blending. Since 1947, Mr. Hall has been senior technical officer on the planning staff of the National Coal Board's Carbonisation Department.

OBITUARY

WILLIAM HAWKYARD

Mr. William Hawkyard, former General Manager of the Tottenham division, Eastern Gas Board, died on December 22, less than two years after his retirement. Throughout his life he had been particularly active and only a week before had dined out with friends. He was virtually a victim of the December fog and when he was taken seriously ill with bronchitis he was admitted to the Prince of Wales Hospital, Tottenham, where he died. Mrs. Hawkyard predeceased him by four years to the day. Mr. Hawkyard served the gas industry for 47 years, starting in 1904 in the Bradford Road works of the Manchester Corporation. In 1927 he went to the old Tottenham and District Gas Company as superintendent at Willoughby Lane and there saw many important extensions, including the installation of new intermittent vertical chamber ovens which the late King George VI, then Duke of York, declared open. In 1945 he was transferred to Woodall House, head office of the company, as Deputy Engineer and a year later he was appointed Chief Engineer.

Mr. Hawkyard became first General Manager of the newly constituted Tottenham division of the Eastern Gas Board on nationalisation and when he retired Mr. E. C. Woodall (member of the board and Chairman of the old company) paid him the tribute of being 'a good chief, a good engineer, and a good friend.' He had seen many changes in his day. He used to recall that in his early years in the industry a labourer worked from six in the morning to 5.30 at night for the magnificent sum of one golden sovereign per week. In those days coal from the Yorkshire pits was 10s. a ton and oil came up the Manchester Ship Canal at $\frac{5}{8}$d. per gal. At a farewell presentation he said he was never happier than with his friends at Tottenham. He was not sorry to go for he felt he had done his quota. But his friends little thought that the retirement of so vigorous a personality would last a bare year or so.

At the funeral at Enfield Crematorium on December 29 there were mourners from all parts of the division and from area headquarters. Representing the Eastern Gas Board were Sir John Stephenson, C.B.E., J.P. (Chairman), Mr. J. H. Dyde (Deputy Chairman), Mr. E. C. Woodall, Mr. R. H. Epps (Secretary), Mr. H. R. Hazeldine (Chief Accountant), Mr. F. T. Brookes (Tottenham Division General Manager, who also represented Colonel Harold C. Smith, Chairman of the Gas Council), and Mr. T. C. Battersby (Watford Division General manager). From Willoughby Lane works were foremen and workmen representative of every department, and there were also a number of pensioners of the old Tottenham Company. Among contractors' representatives were Mr. A. F. Topley and Mr. H. E. Dyble, of the Woodall-Duckham Company, Mr. W. H. G. Roach and Mr. John Garrett, of William Press & Son, Ltd., and Mr. R. H. Heath, of E. Foster & Co. and Stephenson Clarke. Rotary colleagues of Edmonton with whom Mr. Hawkyard had long been associated also attended.

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Mr. T. A. Haslock, who died at Bingley on December 29, aged 72, was chief draughtsman with the Bradford Corporation Gas Department until he retired in 1945. He went to Bingley from Farsley in 1918, and at one time was a lecturer at Bradford Technical College and was also for many years at the Belle Vue Evening Institute, Bradford. His eldest son is Bingley's Water Engineer.

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Mr. John C. Blandy, of Reading, whose death at the age of 90 is announced, succeeded his uncle, Mr. H. B. Blandy, as a Director of the Reading Gas Company in January, 1917, and remained on the Board for many years, being Chairman of the company from 1931 to 1936. His uncle had been a Director of the company from 1863 to 1916, so that the family was represented on the Board for a continuous period of 73 years.

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Mr. Burt Long, who retired in 1951 after 32 years' service with the Horley gas undertaking, died on December 13, aged 54. He went to Horley in 1919 as Assistant Manager and Secretary of the former Horley District Gas Company under Mr. Seymour Tobey, and on the latter's retirement was appointed Secretary, and later General Manager. For many years he was also a Director of the company, and from vesting date until his retirement he was local Manager under the South Eastern Gas Board.

Letter to the Editor

GAS EDUCATION SCHEME

DEAR SIR,—I am grateful to Lieut.-Col. J. A. Gould, Distributing Engineer, South Eastern Gas Board, for calling my attention to two modifications necessary to the charts I presented at the Institution of Gas Engineers Research Meeting and which you published on pages 618 and 619 of the *Journal* of December 10. They are:

(1) For the Full Technological Certificate in Gas Fitting, Engineering Drawing up to S2 standard is required. Thus, unless a student has had previous tuition in this subject, he may need longer than the four years period shown in the diagram to cover his ancillary subjects at evening classes.

(2) Students taking the Higher National Certificate in Civil Engineering (Gas) who wish it to rank for exemption from the Associate Membership examination must, at some time during their course, pass an examination in English up to the standard of matriculation, the General Certificate of Education, or their equivalent.

Yours faithfully,

R. N. LE FEVRE,
Training and Education Officer.

North Thames Gas Board,
Watson House, Fulham, S.W.6.

December 31, 1952.

Diary

Jan. 10.—Scottish (Western) Juniors: Meeting at Heriot-Watt College, Edinburgh. Address by Dr. E. A. C. Chamberlain, Chief Scientific Officer, National Coal Board.

Jan. 12-13.—Women's Gas Federation: Eighth Branch Conference, Caxton Hall, Westminster, S.W.1.

Jan. 15.—London Juniors: Alternative Afternoon Visits. 2 p.m. Kodak, Ltd., Wealdstone, Middlesex, Dewrance & Co., Ltd., Great Dover Street, S.E.1.

Jan. 15.—Institution of Heating and Ventilating Engineers: Joint Meeting with the Institute of Fuel (East Midlands Section). 'An Investigation into Whole House Heating,' J. C. Weston. Nottingham University, Highfields, 6.30 p.m.

Jan. 16.—Scottish (Western) Juniors: 'Oil Gas Processes,' E. J. Lawton (Power-Gas Corporation, Ltd.).

Jan. 17.—Western Juniors: Visit to Bath Works. Presentation of papers by Student Members.

Jan. 19.—Eastern G.C.C.: Connaught Rooms, W.C.2, 2 p.m.

Jan. 20.—London and Southern Section, I.G.E.: 'Ancillary Plant in Relation to East Greenwich Reconstruction,' C. Scott and B. C. Hinwood, 17, Grosvenor Crescent, London, S.W.1. 2.40 p.m.

Jan. 21.—South Western Section, I.G.E.: 'Nationalisation-Metamorphosis of an Industry,' J. W. Dean (Weston-super-Mare).

Jan. 21.—Manchester Juniors: Visit to Cadishead Works of Lancashire Tar Distillers, Ltd.

Jan. 22.—Eastern Juniors: 'Small Works Practice,' H. W. M. Fiske and E. S. Williams (Members): Peterborough.

Jan. 22.—Midland Juniors: Half-day Visit to B.S.A. (Tools), Ltd., Birmingham.

Jan. 30.—London Juniors: Short Paper Meeting, 178, Edgware Road, W.2. 6.30 p.m.

Jan. 30.—Scottish (Western) Juniors: Annual Dance. Georgic Restaurant, Glasgow.

Feb. 2.—West Midlands G.C.C.: 'Dudley Room,' Queens Hotel, New Street Station, Birmingham. 2.30 p.m.

Feb. 3.—Midland Juniors: 'Medical Service in the Gas Industry,' Dr. F. H. Tyrer.

Feb. 3.—South Eastern G.C.C.: Caxton Hall, Westminster, S.W.1. 2.15 p.m.

1953 'Journal' Directory

THE following changes have been notified during the past month. To keep the information in the 1953 edition of the *Gas Journal Calendar and Directory* up to date readers are invited to note these alterations (together with the appropriate adjustments relating thereto in the 'personnel' section of the *Directory*, pp. 141-156):

Page 17.—BRITISH RAILWAY TRAFFIC AND ELECTRIC CO., LTD.: T/A should read Londinense, Wesphone, London.

„ 26.—GAS COUNCIL: A. R. McBain, C.B., C.B.E., vice O. R. Guard (Southern).

„ 59.—NORTH WESTERN GAS BOARD: Add H. Teasdale, B.SC., *Training and Education Officer.*

„ 97.—SOUTHERN GAS BOARD: A. R. McBain, C.B., C.B.E. (formerly part-time member), *Chairman*, vice O. R. Guard, now a part-time member.

„ 106 and 110.—CLWYD AND DEESIDE GROUP: Chairman and Convener's address: 93, Wellington Road, Rhyl. T/N Rhyl 1495. Deputy Chairman's T/N Holywell 465.

„ 110.—LLANIDLOES: R. A. Davies, *M.*

„ 112.—BUCKLEY: R. O. Roberts, *Temporary E & M.*

„ 130.—PETERHEAD: J. Guyan, *Dist.M.*

„ 137 and A1.—ASCOT GAS WATER HEATERS, LTD.: Head Office (as from January 12), 255 North Circular Road, London, N.W.10. T/A Gascot Phone London; T/N WILlesden 5121; Cables Gascot London.

„ 168.—GAS SUPPLY CO., LTD.: Delete information relating to plant, make, c.v., and consumers appearing against head office. BACCHUS MARSH: K. Davis, *M*, vice J. Hutchieson. QUEENSCLIFFE: C. A. Monk, *M*, L. B. Tomlins, *S.* SALE: J. Hutchieson, *M.*

„ A3.—CHEMICAL ENGINEERING WILTONS, LTD. (Not Chemical Engineering & Wiltons, Ltd.)

„ A4 and A189.—SAMUEL CUTLER & SONS, LTD.: Address now changed to 70, Victoria Street, S.W.1. T/N TATe Gallery 9592. Milwall T/A on page 189 should read 'Cutler Milwall London.'

'Gas Service Pocket Book'

THE 1953 EDITION of the *Gas Service Pocket Book*—that *vade mecum* for all on the service side of the gas industry—is new in all respects. Its format is changed, and the information presented is entirely re-written. Expert advice has influenced both selection and setting out of the facts and figures, and the tables and data have been so assembled as to give speedy and authoritative answers to the queries which the service man encounters every day

The new edition is 5 in. deep and 3 in. wide—an ideal shape for the waistcoat pocket. Bound in dark blue rexine, with gilt lettering, the pocket book is handsome to look at and pleasant to handle. Despite its 112 pages of text and tables, plus a two-page-to-a-week diary section, it is not too bulky and the flexible binding renders it comfortable to carry.

Major sections deal with service pipes and metering, gas installation pipes, ventilation, refrigeration, flues for appliances, cooking, water heating, home laundry, and space heating.

The 1953 *Gas Service Pocket Book* may be obtained from Walter King, Ltd., 11, Bolt Court, Fleet Street, London, E.C.4, price 5s. We would urge readers who have not so far obtained their copy to do so before stocks are exhausted.

LEEDS CATERING EXHIBITION

THE Leeds group of the North Eastern Gas Board recently staged in the Market Hall showrooms, with the support of the manufacturers, a special display of industrial and commercial catering equipment.

The exhibition ran for one week, and to give added interest, the Board collaborated with the Manchester office of the Tea Bureau, presenting daily film shows and demonstrations of tea making. Arrangements were made with the Bureau to send out 500 invitations to works canteen supervisors, municipal organisations, hospital authorities, training colleges, etc., and the first response has been extremely satisfactory.

The demonstrations and films were given each afternoon, and shows were arranged specially for the Yorkshire Training College of Housecraft and the Leeds College of Food Technology. Our photograph shows the first floor of the showroom where the exhibit was staged.

Cooking in the New Homes

Cooking in the New Homes has been published by the Gas Council primarily for the information of local authorities, housing managers, architects and builders. It illustrates new housing schemes in London, in provincial towns and in rural areas, and includes views of some typical gas kitchens which have been installed. Particulars of the number of tenants choosing gas for cooking have been given in each case, and include such typical examples as those of the L.C.C. estate at St. Pauls Cray, Kent, where 3,276 (86%) of the dwellings completed have gas cookers, and the 31 estates in West Herts. where 2,881 houses of 3,171 (90.8%) have gas cookers. The booklet includes points to note regarding the position of the cooker in the kitchen, gives details of the appearance and performance of the modern gas cooker, and summarises the advantages of gas cooking from the point of view of the housewife, the local authority and the nation.

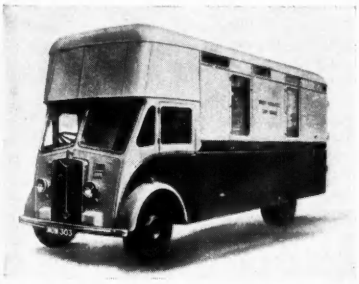
Commercial and Industrial Education

THE Duke of Edinburgh has consented to become Royal Patron of the British Association for Commercial and Industrial Education. The Association, known to industry as 'Bacie,' was founded in 1919, as the Association for Education in Industry and Commerce, to promote and improve industrial and commercial education and training. Among those associated with the work of the Association is the Chancellor of the Exchequer, Mr. R. A. Butler, who gave an address at its annual general meeting in 1949, in which he appealed to industrial and commercial firms throughout the country to release as many young people as possible for further education on at least one day a week in anticipation of the 'County College' clause of his own Education Act of 1944. Mr. Butler is a Vice-President of the Association.

The Association has a number of flourishing regional branches, including a West of England branch, based at Bristol, of which Sir Philip Morris, Vice-Chancellor of Bristol University, is Chairman. Other branches are based at Birmingham, Manchester, Nottingham and Leicester, Edinburgh, Glasgow, and London. The Chairman of the East Midlands group, based on Nottingham and Leicester, is Dr. Herbert Schofield, formerly Principal of the Loughborough College and now Vice-Chairman of the National Advisory Council for Education in Industry and Commerce. Vice-Presidents include Sir Harold West, Managing Director of Newton Chambers & Co., Ltd.

The Chairman is Major W. F. F. Scott, M.C., a Director of Tube Investments, Ltd., and among former chairmen have been Dr. Percy Dunsheath, C.B.E., now Chairman of Convocation of the University of London and a former President of the Institute of Electrical Engineers; also Mr. Graham Satow, O.B.E., a former General Manager and now a local director of Stewarts and Lloyds, Ltd.

A WELL-EQUIPPED MOBILE SERVICE UNIT



The Guy Otter diesel mobile service instruction unit operated by the West Midlands Gas Board.

A REMARKABLY well-equipped mobile service instruction unit, mounted on a Guy Otter diesel 14 ft. 9 in. wheelbase chassis and with a body by Jennings of Sandbach, has been put into service by the West Midlands Gas Board. The vehicle, which was supplied through Rylands Garage, Ltd., Guy distributors for Birmingham, is fitted with an extensive range of gas appliances, varying from a cooker to a small furnace, and is being used throughout the West Midlands to help in the training of apprentices and fitters. Gas for operating the apparatus is taken from normal supply sources wherever the mobile service unit is demonstrating.

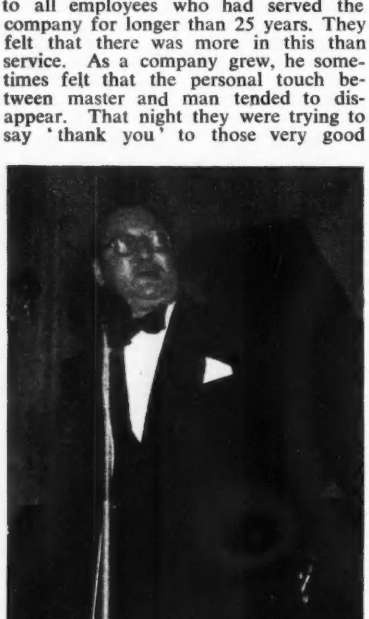
Part of the interior of the mobile service vehicle, showing some of the gas appliances used for instruction.

Celebration of 175 Years' Service

A TRULY historic event was that on December 11 last when Sidney Flavel & Co., Ltd., of Leamington Spa, celebrated 175 years' service to the gas and allied industries. The occasion was marked by the firm's entertainment at a ball and a cabaret at Chesford Grange, Kenilworth, and at the Palais de Dance, Leamington Spa, of 1,000 employees. Long-service awards were made to 29 employees. Each man received a handsome clock with name plate engraved and also a special commemoration badge. The ladies and some of the older employees received gold watches.

Mr. DUNCAN WRIGHT (Chairman and Managing Director) said that the celebrations were really threefold, the most important being the 175th anniversary of the company. It was no mean feat in itself to have been trading for 175 years, but to have been trading successfully for this period of time was, to his mind, a wonderful record. They at Flavels were indeed proud to have this grand tradition, and their present feelings were that they were going on trading successfully for a long time to come. They had gathered together an enthusiastic, keen, loyal and hard-working team, and it would be their endeavour to produce appliances which would be more than acceptable to the gas industry and a benefit to the housewife and the consumer.

The second reason they were gathered together was for the purpose of congratulating and recognising employees with very long records of service. Some had retired, but the majority were still with them. It had given the present Board, and he would like to include Mr. Arnold Jackson, very great pleasure to use this fitting occasion to show their recognition by making a presentation to all employees who had served the company for longer than 25 years. They felt that there was more in this than service. As a company grew, he sometimes felt that the personal touch between master and man tended to disappear. That night they were trying to say 'thank you' to those very good friends and loyal servants. Those loyal servants had between them served for nearly 1,000 years—to be precise—946 years. The oldest employee had served 57 years—this, in itself, was a wonderful record. They hoped that they would continue to have the loyalty which had been shown to the company in the past.



The Chairman and Managing Director, Mr. Duncan Wright.

The third item was rather a sad one in the proceedings. This was for them to say farewell to Mr. Jackson. Mr. Jackson had been a friend of every man and woman in the firm. No one had ever sought Mr. Jackson's advice in vain, or received anything but a kindly word.

Mr. W. A. JACKSON (retiring Chairman and Managing Director), in a short speech, suggested that today the Company was better than it had ever been, and it was a fitting gesture of the Board on that occasion to make the presentation to those loyal servants totalling nearly 1,000 years.

Early Days

Sidney Flavel and Co., Ltd., was founded by John Flavel (1754-1834) in 1777. He was joined by his son William, and inventions began to arrive soon afterwards—among them his vapour bath and most important of all 'The Patent Kitchener,' which superseded the open fire and spit for cooking purposes. Expansion of the works quickly took place, and in 1844 Sidney Flavel became proprietor. This was the time when mechanical power was fast increasing general prosperity, and the supremacy of British-made goods was demonstrated at the Crystal Palace Exhibition of 1851. Flavel's kitchener received one of 17 prize medals out of 19,000 exhibitors. Since then the firm have won many prizes and diplomas in all parts of the world.

In 1861, in the 'Great Western Official Illustrated Guide' is to be found an interesting passage:

'Approaching Leamington, and close to the line, may be observed the spacious and most important premises of the firm. The Eagle Foundry is the largest manufacturary of the kind in the world and especially prominent in a new manufacturing town like Leamington. An idea of the magnitude of the operations of the firm may be gathered from the fact that 100 hands are constantly employed, and not less than 50 kitchen ranges of various sizes, from 3 ft. wide to 16 ft., suitable for the cottage or the palace, are made every week.'

In 1856 Flavel's were producing a portable kitchener which was awarded a silver medal at the Royal Agricultural Show held at Warwick. The papers seemed impressed:

The retiring Chairman and Managing Director, Mr. W. Arnold Jackson.

'We feel bound, too, to notice a most conveniently arranged portable kitchener, mounted on legs, which can be used in any room of the house by attaching a pipe to it to convey the smoke into the chimney, price only £5.'

Since then design and efficiency have improved by leaps and bounds and no emphasis need be laid on Flavel's modern appliances. Kitcheners and cookers were by no means their only specialities. Following exhaustive experiments by the South Metropolitan Gas Company in developing Theobald's patent, coke-burning appliances were made and distributed from Leamington. They were produced in varying shapes and sizes to fit any position. Another striking product was the 'Metro-Log' gas fire. Flavel's also introduced an innovation in radiators, abandoning the tubular column and employing the now popular convected heat design.

War Work

During the last war the production of gas appliances was badly handicapped by the precedence accorded to ammunition boxes, bomb and shell cases, and so on. The well-equipped casting foundry (Imperial Works) was disposed of to the Ford Motor Company for the manufacture of steel ammunition parts; but even with the loss of factory space and bomb damage to the Eagle Works, many thousands of gas cookers were supplied to Government housing schemes in the immediate post-war period.

The great traditions of this old-established company are today being maintained with a vigour and alertness equal to those of any period in the firm's history. This alertness is well indicated by the design of the various types of gas and coke appliances manufactured at Leamington.

Long Service at William Sugg's

Firm May Have Established a Record

IN one feature the presentation of gifts to long service employees of William Sugg & Co., Ltd., on December 23, was dissimilar to most ceremonies of this nature. Until all the employees were assembled in the staff canteen and the Managing Director, Mr. W. T. Mattock, had announced the purpose of the meeting the whole affair had been a closely guarded secret.

For the 115 years the firm has been in existence it has been run very much as a family concern and, as Mr. Mattock said on this occasion, it may well have established a record in the engineering industry for long service among its employees. Before additional workpeople were taken on in June to meet the needs of the present considerable armament programme, there were 330 employees of whom 57 had done over 30 years' continuous service and 20 had done over 40, and three had done over 50. To each of those who had served for over 50 years Mr. Philip Sugg, Chairman of the Company, presented a gold watch and a cheque for £50, and to those who had served for over 40 years he presented a gold watch. Those who had served over 30 years received an engraved silver salver from Mr. Mattock.

A Wholly-Owned Subsidiary

In the course of his remarks Mr. Mattock explained how Cowper Penfold & Co., Ltd., had been taken over as a wholly-owned subsidiary. William Sugg & Co., Ltd., had taken a financial interest in the firm 18 months ago, he said, and this latest move was based on the belief that Cowper Penfold was selling appliances which his own firm could well make, and the desire to fill up their own factory. Mr. C. C. Penfold had therefore, joined the Board of William Sugg & Co., Ltd., the other members of which were Mr. Crawford Sugg, Mr. Young and, of course, Mr. Philip Sugg and Mr. Mattock.

They then realised, continued Mr. Mattock, that they would have to extend their space heating appliances. They were proposing to build a factory at Crawley which would be a sheet metal works and assembly works for such appliances as space heaters, and where they would have some very large, open workshops. At Regency Street the biggest shop they had was about 3,000 sq. ft., but at Crawley they hoped to have shops of 10-20,000 sq. ft. They were not going to move out of London and go to Crawley; the present works would definitely continue to operate. There was no question of moving any machinery or plant—or very little—and it would possibly be a matter of moving perhaps 20 or 30 employees down to Crawley and that was all. In any case they would not have a works at Crawley for two years.

Referring to some of the things which the Board tried to do for its employees Mr. Mattock said that the profit-sharing bonus was started some ten years ago and 10% of the profit before taxation was set side for division among the manual workers. It was then decided that whatever that worked out to they would also extend to the staff and executive workers (but not the Directors), and in point of fact they were sharing out about 15% of the profit; this year it had cost the Company approximately £9,000. In addition, the superannuation scheme cost the Company approximately £5,800 a year and other pensions cost a further £1,800 per year.

This totalled about £17,000. The shareholders' 25% dividend cost the Company in 1952 £14,400. In his view the employees were not doing too badly.

Mr. W. T. Mattock, Managing Director of William Sugg & Co., Ltd., presenting a silver salver to Mrs. V. T. Booker who has been 31 years with the firm.

Mr. Philip Sugg, Chairman of the Company, presenting a gold watch and cheque to Mr. C. England in recognition of his 55 years' service.

In the course of his remarks Mr. Philip Sugg recalled that it was about 50 years ago that he entered the service of the Company. Among the recipients of the awards were men who were just apprentices at that time and who were his friends. They were craftsmen, and his own ambition which he had realised —to get to the head of the firm—was a piece of craftsmanship in itself.

West's Gas

THE TECHNICAL FEATURE in the December issue of West's Gas Improvement Company's house journal is an essay on the modern gasworks electric motor. Written in collaboration with an expert of one of the best known manufacturers of these machines it should serve as a useful guide to the principles underlying the choice of motor for the particular job. It is well illustrated by drawings and photographs.

Among other features is the presentation of long service awards to employees of the Company made by Sir Frederick West in person and including in 1952 one award for 50 years' service, five gold watches for 40 years (this section includes the name of Mr. Ronald B. Glover) and eight certificates for 25 years' service.

Those of us who met Mr. J. A. Helliwell, the New Zealand representative of the Company, while he was in England this year on a long vacation with his wife and daughters, will be interested in 'Impressions of England' contributed by the Misses Helliwell.

Annual features of the Christmas Number are 'The Chief's' Christmas message and reproductions of the winning photographs in the holiday competition.

Ascot Headquarters.—From Monday, January 12, the head office of Ascot Gas Water Heaters, Ltd., will be transferred from Park Street, W.1, to 255, North Circular Road, London, N.W.10. Telephone Willesden 5121; telegrams Gascot Phone London; cables Gascot London.

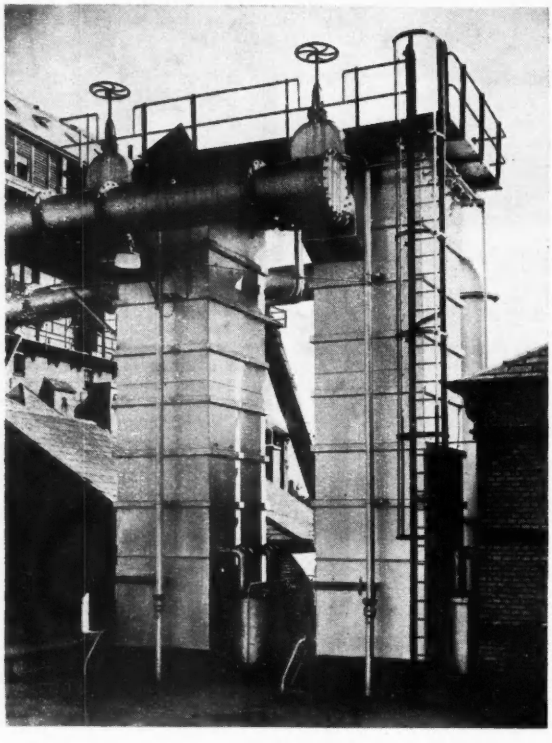
Ewart & Son, Ltd., have transferred their service department from Ascham Street, N.W.5, to 35, Kentish Town Road, London, N.W.1. Correspondence should be addressed and appliances for repair sent to 35, Kentish Town Road, London, N.W.1. Telephone Gulliver 6171/4.

The Right Use of Coke is the subject of a new lecture prepared as a leaflet by the Gas Council for the use of gas industry speakers under the heading of 'Heating the Modern Home.' It is intended for lay audiences and is supported by 35 illustrations in slide or film strip form.

Within the Next Few Weeks electricity will be generated for the first time at Newman Spinney, Killamarsh, near Sheffield, by means of low calorific gas supplied by the underground gasification system. The gas for the experiment is being supplied by a burning seam containing about 1,000 tons of coal—sufficient to provide gas for a period of four to five months.

BRITISH PLANT for DENMARK

A RECENT installation for the Odense works of the Danish Gas Company has provided the opportunity for British manufacturers to make a contribution to the technique of gas treatment in Denmark and at the same time to add materially to the exports of the British gas plant industry.

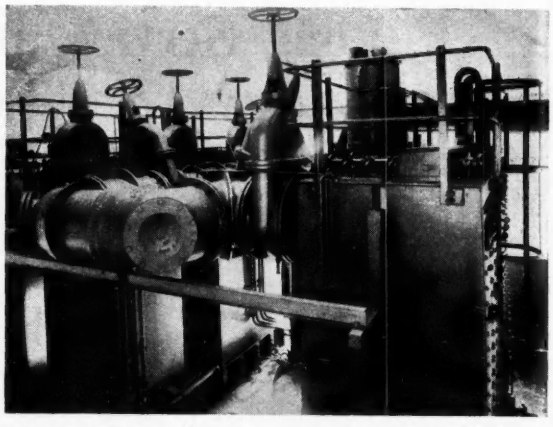


Two Whessoe vertical water-tube multi-pass condensers, each having a capacity of 2,825,000 cu.ft./day, forming part of a complete gas treatment plant at Odense, Denmark.

Whessoe Ltd., of Darlington, had previously supplied condensers and electro-detarrers to Denmark and on the occasion of an extension of cabonising plant at Odense the firm secured a contract against continental competition for a 'complete stream' of ancillary plant to match the increased works capacity of 100,000 cu. m. per day (3½ mill. cu. ft. per day). In view of the attention given in this country to integrated plant for gas condensing and cleaning, the following notes on what is probably the most modern equipment of its kind in Denmark are of interest.

On the basis of an output of 3,500,000 cu. ft. per day of I.V.C. and C.V.R. gas, a plant arrangement was agreed. The gas from the retorts passes through two condensers, which operate in parallel, to two electro-detarrers, also working in parallel. Subsequent units on the stream are naphthalene and ammonia scrubbers, after passing through which the gas is treated by existing purifiers.

The two condensers are vertical water-tube eight-pass parallel gas flow units, each having a capacity of 2,825,000 cu. ft. per day. Cooling water is taken from the nearby river.

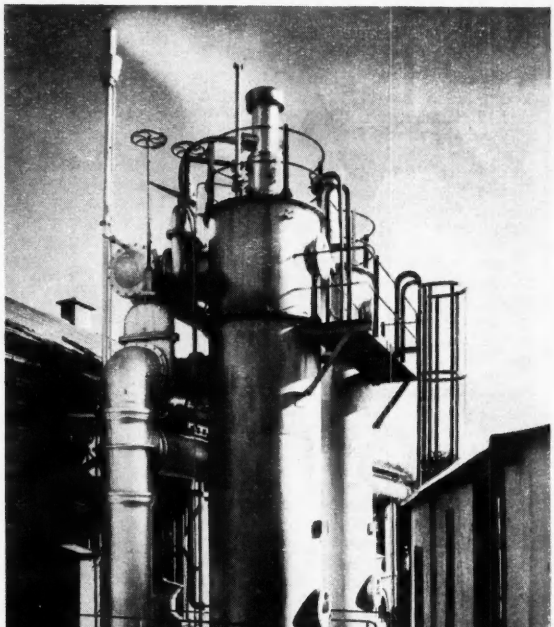


Whessoe static scrubbers for ammonia removal (left) and naphthalene removal (right). Each scrubber has a capacity of 3½ million cu.ft./day. (Photographs by Ole Borch, Copenhagen).

Owing to the presence of solid matter in the water, Whessoe designed these condensers with hopper bottoms having quick opening valves for the removal of accumulated sludge. In order to prevent the sludge valves freezing up during winter, a continuous supply of water is passed through them via small pipes. To remove deposits from the external surfaces of the tubes, each condenser is fitted with the Whessoe system of 'false tube plate' flushing, warm retort house liquor being the flushing medium.

The two W.W-D tubular electro-detarrers operating in parallel are from the standardised range of sizes developed by the makers. Each detarrer has a capacity of 3,500,000 cu. ft. per day and operates independently from its own static transformer-rectifier set.

The naphthalene scrubber (multi-stage static type) consists



W.W-D. tubular electro-detarrers, each with a capacity of 3½ million cu.ft./day.

of two three-bay sections in series. Gas oil is recirculated in each bay by Lee Howl multi-cell horizontally split casing centrifugal pumps having special glands between the cells to obviate inter-cell leakage. The scrubbing oil is distributed film-wise over grid packing by the Whessoe/North Thames Gas Board trough system of distribution. Oil is fed to the scrubbers from an overhead tank equipped with a float switch which operates the supply pump when the oil falls to a certain level.

The construction of the ammonia scrubber is similar to that of the naphthalene scrubber. The two four-bay sections operate similarly in series. Both static scrubbers have a capacity of 3,500,000 cu. ft. per day.

The contract was undertaken in co-operation with Edwards & Rasmussen, Gas Engineers, of Copenhagen, who as local contractors undertook erection and the supply of gas valves and mains, water, oil, tar, liquor and steam services. This plant was designed throughout by Whessoe and all the major units were fabricated at Darlington. Final supervision and commissioning was in the hands of a Whessoe operating engineer, who was also able to make the gas company's staff conversant with the operating and maintenance features of this composite plant.

The plant described above was put into operation last year and Whessoe has subsequently received orders for four multi-stage static scrubbers, of the same type as those described, for installation at the Eastern gasworks of the Copenhagen Lighting Department. There will be two ammonia scrubbers, each having a capacity of 7 mill. cu. ft. per day, one ammonia scrubber having a capacity of 17 mill. cu. ft. per day, and one naphthalene scrubber having a capacity of 8½ mill. cu. ft. per day.

DINNER TO LONG SERVICE EMPLOYEES

THE Chairman and Directors of C. & W. Walker, Ltd., gave a Christmas dinner party on December 12 to the company's long service employees. Some 300 members of the organisation and their guests were present, including Mr. and Mrs. Woodfine, Mr. and Mrs. F. S. Johns, Mr. and Mrs. J. D. Daniels, Mr. and Mrs. W. Tinniswood, and Inspector and Mrs. J. B. Jones.

Mrs. R. A. Rubery presented a bouquet of pink carnations to Mrs. J. Milbourne and a buttonhole of similar flowers to the Chairman, Mr. S. M. Milbourne.

The Chairman extended a warm welcome to the visitors and to long service employees with 50 years service and over. Mr. Milbourne said that he would take the opportunity of honouring an old friend, Mr. George Harris, of Newport, who had completed no less than 70 years' unbroken service in the company's employ. He then handed to Mr. Harris a tankard bearing the inscription 'To Mr. George Harris (Old George) from the Directors of C. & W. Walker, Ltd., in appreciation of his long service with the company from 1873 to 1943.' Mr. Harris, who is now 92 years of age and retired nine years ago, thanked the Directors for their gift.

Councillor R. Millward, who has completed 35 years' service proposed the toast of 'The Company,' to which Mr. J. Willis Brown, Director, replied.

Some of the 300 members and guests at the Christmas dinner party.

Mr. S. M. Milbourne, Managing Director, presents a tankard to Mr. George Harris, aged 92 who retired in 1943 after serving 70 years with the company.

Coronation Year Calendars and Diaries

WE warmly appreciate the seasonable greetings which have been expressed in many tangible forms during the Christmas and New Year season and take this earliest opportunity of reciprocating the kind wishes received. The spirit of Coronation year is reflected in the more elaborate and colourful designs that adorn many of this year's calendars.

From the East Midlands Gas Board we have received a copy of the 1953 Year Book giving a very conveniently arranged list of area, divisional, and district officers and principal diary events for the year.

Among tokens received from the contracting and manufacturing side of the industry are the following:

Babcock & Wilcox, Ltd.—Pocket book of useful tables.

Bardsleys - Colchester, Ltd.—Wall calendar.

Benham & Sons, Ltd.—Pocket Diary.

British Oxygen Co., Ltd.—The B.O.C. desk diary, including information of the many B.O.C. services to industry.

British Vacuum Cleaner & Engineering Co., Ltd.—Pocket diary and reproduction oil painting wall calendar.

R. & J. Dempster, Ltd.—Set of 1953 date cards for the familiar R. & J. D. retort-shaped desk calendar.

Drakes, Ltd.—Note case and refill for pocket diary.

Dunlop & Ranken, Ltd.—Monthly tear-off wall calendar.

George Kent, Ltd.—Pocket diary.

R. & A. Main, Ltd.—Pocket diary and chromium plated pocket torch.

A. Monk & Co., Ltd.—Wall calendar with monthly tear-off and year at a glance.

Joseph Morton, Ltd.—Wall calendar featuring a beautiful picture in colour of St. George's Chapel, Windsor.

Stewarts & Lloyds, Ltd.—Office desk calendar.

Richard Sutcliffe, Ltd.—Wall calendar featuring photograph of Fountains Abbey.

Wellman Smith Owen Engineering Corporation, Ltd.—Colourful monthly tear-off wall calendar including, for June, a portrait of the Queen.

Westwood & Wrights, Ltd.—Monthly tear-off bold figure wall calendar.

Widnes Foundry & Engineering Co., Ltd.—Pocket diary.

Hugh Wood & Co., Ltd.—Large wall calendar illustrating in colour the heraldry of the coal counties of Britain and the coal producing countries of the British Commonwealth.

Distribution with an Expanding Load

By K. E. BROWN,
District Superintendent and Engineer (Mains), Northern Gas Board

From a paper to the North of England Section of the Institution of Gas Engineers

THE annual load in the area that is now the Newcastle division of the Northern Gas Board has risen since 1939 from 8,000 mill. to 17,000 mill. cu.ft.; the peak day has risen from 33 mill. to 63 mill. cu.ft.; the maximum hour from 2¼ mill. to nearly 5 mill. cu.ft. In meeting this sharp though gratifying increase, many stresses have arisen, have been overcome, and have in turn been overlaid by greater problems which have had to be met, not always with an ideal solution, but with the resources to our hand. It is of this race between increasing consumption and available distribution capacity that this paper is concerned.

Inevitably an increasing load under present conditions has meant increasing the pressures carried on distribution mains, with its attendant undesirable characteristics of greater leakage, wider variation in pressure at the consumer's appliance, and, more important still, slower registration of meters.

The leakage is proportional to the square root of the pressure carried, and since the increased pressure is operated only over a comparatively short period and only areas nearest to the works suffer the highest pressures in our attempt to keep the far end of the district adequately supplied, our increasing district pressures over peak load have probably not a substantial effect upon the leakage account.

While I would much prefer that the pressure at the consumer's meter should not vary by much more than 1 in. W.G., this standard is not likely to be attained at the present time, and I would suggest a figure of 2 in. maximum variation in any part of the district as a figure at which we should aim. It has been suggested that a figure of 2 in. differential should be used in calculating the mains for new housing estates, but I think that this is too high, having in mind extensions to estates which may occur and the pressure losses already taking place in the trunk mains to the estates.

A More Serious Matter

The slower registration of meters is, however, a much more serious matter. Whereas 20 years ago meters brought from the district proved to be predominantly fast, today they are predominantly—in fact almost entirely—found to be slow, and this slow registration is accentuated by increasing pressure. All meters do not appear to be affected in this way, but the great majority of meters tested over a range of 2 in., 5 in. and 7 in. are found to be slow at the increased pressures.

The average increase in slowness is from 0.84% to 1.99% with pressure raised from 2 in. to 5 in., this being 2.19% with an increase in pressure to 7 in. This registration can be improved with oil spraying. With such spraying there is immediate improvement in the registration, but how long this will last might be another story. We have always been afraid that the oil will become stiff and will collect dust and corrosion, making our last state worse than the first. To check on this, meters have been set to work in the shop and they will be tested periodically.

While increased leakage is proportional to the time over which greater pressures are carried, this does not apply to the question of slower registration. Higher pressures are carried at the time of peak demand and naturally the effect on the registration is at its highest.

It is believed that this tendency to slowness of meters, even a few years old, is due to corrosion, hardening of the stuffing box oil, and dragging of the valves; and while it is true that these causes were also operating 20 years ago when meters tended to run fast after a few years in service, it is thought that this might be due to shrinking of the bark-tanned diaphragm. The modern chrome-tanned diaphragm does not appear to shrink, or at least not to the same extent.

I have considered the difference in tanning of the diaphragm as the cause of the difference in registration. So far as I am aware, it is the only major change in the make-up of a meter which could have affected registration in this way. However, recently my attention was drawn to another possible cause of shrinkage. Arising out of an investigation of the effect of a dye upon leather it was noted that this dye was a coal-tar derivative and it might be that the difference in registration of meters to-day as against 20 years ago is due to benzole washing, the phenol being in part removed.

This investigation arose out of an attempt to dye some leather gloves, the gloves having shrunk to approximately one-third of their original size. It was most remarkable that the shrinking had taken place so uniformly that one might have thought that the gloves had been made in a small size

My first reaction was that experiments would be well worth while to determine whether a low percentage of this dye carried in a spraying oil might be of service, and these experiments are already in hand in two forms. First, the impregnation of diaphragms with the usual dressing to which has been added 1%, 5%, and 10% of the dye. This special dressing is being used on experimental meters fitted in the shops only at the present stage, to see if we can reverse the tendency of the meters to run slow by providing diaphragms with a dressing that will cause slight shrinkage over a period. It may be that the whole of this shrinkage will take place when the diaphragms first receive the dressing and before they are fitted to the meter and adjusted to its proper setting. If this is so, this method would not be of further interest. Nevertheless the matter is of sufficient importance to warrant investigation.

Use of Phenol

The second method we are trying is the impregnation of a spraying oil with similar percentages of the dye, the idea being to cause slight shrinkage of the diaphragm to bring the meter back to within the permitted tolerance of registration. In addition to the use of the dye, a separate dressing and spraying oil treated with phenol is being prepared to see if this has a similar result.

The first meter to be sprayed with a 10% solution of the dye was brought from 3.8% slow to 0.5% fast with one spray. A second spray brought this meter to 1.0% fast, and after 48 hours a further test showed it to be 1.01% fast. Having passed 500 cu.ft. of gas, the meter was again tested and found to be 2.56% fast.

These experiments are being conducted on a limited number of meters which are not at this stage being subject to district test, but it is hoped that early results will be sufficiently encouraging for sample meters to be placed upon chosen premises in an attempt to reduce our loss due to slow meters. Even 1% decrease in unaccounted-for gas on domestic meters alone in the Newcastle division would amount to 75 mill. cu.ft. per annum.

The immediate problem, however, is to reduce the average pressure at the consumer's meter over the whole of the district without adversely affecting the supply to people on the periphery of the area, and at the same time substantially to increase the volume of gas handled

The Newcastle division supplies gas to 21 local authorities covering a total area of 400 sq. miles, a large proportion of which is the built-up area on both sides of the Tyne. Even in normal circumstances the extension of trunk mains as new housing develops and improvement of pressures with the growing load is an expensive proposition, particularly as so many of the existing trunk mains pass through the centres of the city and the towns within the area. Today, with inflated costs and difficulty of supply, the task would be even more onerous.

To increase the gas sent out from the works, therefore, without raising the pressure at the consumer's meter implies the conversion of selected trunk mains from low pressure to intermediate pressure. Extension of the high pressure system is going forward; and while I visualise ultimately a complete ring of high pressure mains north and south of the River Tyne, such an extension can cover only a small part of the problem. High pressure gas is expensive, and when we are dealing with the large volumes which are required by the growing townships and housing estates on the edge of the present area the economical pressure is of the order of only 1 lb. to 2 lb. per sq. in.

Considerable development of our high pressure system is, however, taking place, and we are at the present time laying a section of a ring main circling South Shields and Jarrow which will serve the villages of Cleadon, Boldon and Boldon Colliery, and the estates which are growing out towards them. In addition, extensions to the north high pressure ring have been made to supply Fawdon and Forest Hall, this latter reinforcement having a considerable effect on the pressure which will be required to be carried from the St. Anthony's holder station.

The high pressure line south of the river from Redheugh works has been carried westward a further 2½ miles to supply Stella and Newburn, and this will improve the supply westwards generally.

Nine Reynolds high pressure governors have been fixed since vesting date. The high pressure system has been linked to the Howdon works with a new 12 in. main and a 250,000 cu.ft. per hour compressor installed.

Intermediate Pressure Grid

With six works, three to the north and three to the south of the Tyne, the advantages of a ring main interlinking these works and the two holder stations at St. Anthony's and South Gosforth are self-evident, and such a ring, once completed or even part completed, can form the basis of an intermediate pressure grid covering the whole of the built-up area. The addition of such a network has two advantages over a simple low pressure system. First, it will enable more uniform pressures to be maintained at the consumers' premises, and secondly, the grid can be fed selectively by different works to suit the production programme.

The first steps taken have been towards the completion of the intermediate pressure ring, a substantial part of which has existed for some time. To the south of the river, the Jarrow and South Shields works are joined by a 20 in. intermediate pressure main, and on the north side of the river, Howdon and North Shields works are joined by a 24 in. main. Elswick works and St. Anthony's holder are also joined by a 24 in. main, this line being connected over the bridges to Redheugh works, which is thus able to send gas to either of these stations.

In addition to the above works links, a substantial intermediate pressure system extends westwards from Elswick as far as Wylam, a distance of 8 miles. This line has two branches, one northwards towards the new housing estates and one southwards across the Scotswood Viaduct where it joins a 12 in. high pressure main at Blaydon.

Westwards from Jarrow a 24 in. main extended as far as Hebburn where a 24 in. mercurial governor was installed, and north of the river a 24 in./18 in. main runs eastwards from the North Shields works to the mouth of the river at Low Lights. A further intermediate pressure line extends due southwards from the Redheugh works to Birtley and Chester-le-Street, this latter station being fed by Stella Gill coke ovens, and this southward line can, therefore, be used to transfer gas either to or from Redheugh.

It is upon this nucleus that the proposed intermediate pressure network is being built.

The first and most important step, with a view to easing the difficulties of supply during the last few years, has been to complete the interlinking of the various works, and this is particularly important because, by reason of the geography of Tyneside and the location of the coke ovens, the greater part of the gas in the division is manufactured to the south of the river while the greater volume of gas used is to the north.

Jarrow to Redheugh

The first extension since nationalisation was the extension of the Jarrow/Hebburn line westwards as far as the Redheugh works at Gateshead. The conversion of this main will serve as the pattern for all the conversions, and also as a comparison of the relative costs of laying a new main against the conversion of an old one.

A survey of the whole route was made, with a drawing indicating all the connections which were to be transferred, and with the completion of each section of the job a more detailed drawing was prepared. Work commenced in 1949 in laying a new 18 in. intermediate pressure main through Hebburn to Pelaw parallel to an existing 12 in. low pressure main. For the most part the route was straightforward with no engineering problems beyond two railway bridges which had to be crossed. An 18 in. steel main was carried outside the parapet wall of one bridge supported on rolled steel joists built into the bridge, the crossing of the other bridge being under the pavement where sufficient cover was obtained in the footpath.

This was the first occasion on which we used a calf-dozer for back-filling, and where it was possible to use it the cost per yard fell very sharply. The section concerned was under a grass verge and the total labour cost per yard at one time fell as low as 11s. From the end of this main at Pelaw as far as Redheugh there existed a main, part 24 in. part 18 in., and for a great deal of its length a 14 in. main existed parallel to it. Advantage was taken of these existing mains to complete the intermediate pressure line between Jarrow and Redheugh by converting the larger of the two mains to intermediate pressure with a connection to the new 18 in. main at Pelaw.

To complete the low pressure main, 2,000 yards of 12 in. main and 500 yards of 14 in. main from the end of the 14 in. main at Felling were laid to the old 12 in. main at Pelaw. Two 12 in. branches at Felling and Heworth led us to lay a short section of the low pressure main in 18 in. with one 18 in. governor from the intermediate pressure main. This method was somewhat cheaper than fixing two 12 in. governors which would have been the alternative.

I would refer at this point to the desirability of laying this parallel low pressure main whenever a large main is converted to work at intermediate pressures. While a greater volume of gas can be handled through the converted main, its loss from the low pressure system can be felt over a very wide area. Help can be given by the fixing of governors to the low pressure system, but a low pressure trunk main is essential; otherwise the relief given by the governors is very local.

Additional to the 18 in. governor already mentioned, a 12 in. governor was fitted on the edge of the Borough of Gateshead, and a 12 in. branch was taken from the 24 in. main to one of the larger factories in the area, where another 12 in. governor was fitted, this latter governor feeding into the low pressure network outside the factory.

In all it was necessary to cut off 19 branches ranging in size from 4 in. to 12 in., from the large main, and transfer them to either the old 14 in. or the new 12 in. main as it was laid, in addition to innumerable services, particularly lamp services. Many of the services were transferred to small mains in the footpath where these had been laid in front of existing property.

Pressure recorders were maintained in all adjacent areas during the conversion, and as this work proceeded it was apparent that even in summer and with several cross connections between the 18 in./24 in. main and the low pressure main alongside, some of the branch mains being transferred were inadequately supplied and two or three interconnections were required to support the thinner districts prior to the higher pressure being placed on the converted line.

One of the bridges on this route provides a very interesting contrast in pipe crossings. The 18 in. main, now carrying intermediate pressure, is of cast iron, in short lengths all flanged with special duckfoot bends at either end, these bends being supported on brick piers. Immediately above it is the 12 in. steel main in three sections, all welded, bends fabricated on site. This was assembled and slung in one night between midnight and 4.30 a.m., although goods trains were passing at about half-hour intervals.

The total cost of this conversion was estimated at £19,000, the actual cost proving to be £20,926. These figures include reinstatement, the whole route being on a main arterial road carrying heavy traffic.

The cost of laying an 18 in. main in lieu of this conversion would have been £67,000. The saving is therefore substantial.

When the work was completed, the pressure in the new intermediate pressure main was raised by 2 in. with the governor by-pass valves and valves on other cross connections open. These valves were then closed before further raising of the pressure.

Since including this line in the intermediate pressure ring, a 12 in. branch has been taken from it, from Heworth to Sheriff Hill, a distance of 2,970 yds., and an additional three governors have been fitted. This line is within 1,000 yds. of the southern limb to Birtley and about the same distance from the terminal point of an 18 in. semi-high pressure main now being laid, and it is intended to join these ends at an early date.

Tunnel Main

It was a most fortunate chance that the new Tyne Tunnel should be projected at a point adjacent to the Jarrow works on the south bank and not very far from Howdon works on the north bank of the river, and the opportunity has been taken of connecting these two works. This link is most valuable inasmuch as the first bridge across the Tyne is at Newcastle, 11 miles from the mouth of the river. The Tyne Tunnel, only four miles from the sea, enabled the idea of linking all works to be continued.

An 18 in. main has been laid from Howdon to the tunnel entrance and twin 12 in. mains have been laid through the tunnel, one main in the cyclist tunnel and one in the pedestrian section, the mains being laid in the segment under the pathway. This main can be supplied from the fan boosters at Howdon or from the steam driven reciprocating compressors which supply the north high pressure ring. Alternatively gas can be taken from Jarrow to Howdon, this facility being most useful during the final stages of the reconstruction of the Howdon works.

The tunnel mains are of steel, $\frac{3}{8}$ in. thick, red leaded internally and painted with bitumastic paint externally. The main is welded throughout, each weld being ground flush before testing, a collar, previously placed over the pipe, being welded over each joint. The internal coating at the joint was restored by a spraying machine carrying a suitable head, and threaded inside the pipe, after testing at 100 lb.

The mains are supported on brackets bolted to the tunnel segments in the escalator shafts and on concrete plinths in the tunnel, a shaped packing piece of resin impregnated fabric known as Texolac being placed between the pipe and each support.

Quite recently, potential differences were tested and found to be zero, except for one reading of 4 millivolts near to one of the escalator drives.

Gateshead Main

One of our most densely populated areas is the County Borough of Gateshead, bounded on one side by the 24 in./18 in. main recently converted and on the other side by the intermediate pressure main between Redheugh and Birtley. With the growing load, the governors feeding the outskirts of the area from the semi-high pressure mains are very much overloaded.

The area is too large to consider in terms of high pressure, the intermediate pressure main to the south is already at its limit on peak load, and a new main is an urgent necessity. Several schemes have been put forward, but the building of a new technical school and civic centre has largely determined the route, and a size of main has been chosen to deliver twice the requirements of the new buildings when complete. These requirements have been estimated at between 90,000 and 110,000 cu.ft. per hour.

Until these buildings are completed, low pressure only will be required and a connection is being made at the works to enable either low or intermediate pressures to be used on this line. Several connections to the low pressure system are being made, and while governors are not being fixed at the present time, the connections are being fitted with valves so that governors can be fixed when required.

The capacity of this main at various pressures illustrates the flexibility of intermediate pressure mains.

Pressure Loss.	Rate per Hour.
1 in. W.G.	55,000 cu.ft.
3 in. W.G.	100,000 ,,
10 in. W.G.	200,000 ,,
20 in. W.G.	300,000 ,,
2 lb. per sq. in.	500,000 ,,

The main is being laid in surface rock, somewhat harder than shale but breaking much more easily than the sandstone which is immediately below. Sufficient marl is at the surface to avoid bringing in clay to form a bed. The cost per yard through this material is 44s., labour only.

A similar improvement is being made in the north of the area with a view to improving the supply to Gosforth, but in this case a main laid 50 years ago to improve the Gosforth supply is being converted to intermediate pressure. So far as we can trace there are no branch connections at all on this main and our only task is to fix governors and make alternative connections at the works, the estimated cost of this work being £1,500. One 18 in. and one 12 in. governor are being fitted at the present time.

Completion of Ring

With the completion of the tunnel main, the only section between works not provided with a boosting main is the 4-mile section between St. Anthony's holder station and Howdon. This section is of particular importance in view of the large extensions at Howdon, which has been re-built as a 12 mill. per day works in place of the old 3 mill. per day plant, and also because the area—Walker and Wallsend—is thickly populated, with shipyards and other industrial consumers adjacent to the river.

This section has been well examined with a view to the conversion of an existing main. The present outlet from Howdon westwards is a 24 in. cast iron main which feeds three 12 in. mains near the eastern boundary of Wallsend, an 18 in. travelling north into the new housing estate of Walkerville.

The 24 in. would be a good proposition as a conversion, but this main only goes one-third of the way, the 12 in. mains being too small to carry the desired load even if they could be spared. The 18 in. is not in the best direction and would require a parallel main to be laid, as also would the 24 in.

There were complications of this particular problem. First, we are asked for a greatly increased volume to be supplied to the north; secondly, it would be of great advantage to take intermediate pressure to the Gosforth holder, which is in an area of large scale building development, including the Newcastle flats scheme which aims at housing some 10,000 persons; thirdly, more gas is required north-east of Howdon in Whitley Bay and Monkseaton.

To satisfy all these requirements, a route involving 3,000 yds. of 24 in. and 7,000 yds. of 18 in., with the conversion of 10,000 yds. of existing 18 in. main from low to intermediate pressure, has been chosen. This route links Howdon with both St. Anthony's and Gosforth holder stations, and covers a long section, some 2 miles, of the Coast Road where extensive industrial development has taken place.

Steps following the above scheme will involve the conversion of an existing 24 in. main which supplies Whitley Bay from North Shields and the completion of a ring main from Gosforth holder to the West line from Elswick works. Part of this latter ring has already been laid as an 18 in. low pressure main, but it has been kept clear of all connections to simplify conversion to immediate pressure when this is required.

The 24 in. main to Whitley Bay might well be converted in the near future, not to supply more gas at the present time, but in order to reduce the pressures at the consumers' premises and still maintain an adequate supply to the extreme north of this resort. This outlet has already, in fact, been isolated from Tynemouth, which has eased the position. Further development to the south of the river is now dependent on decisions regarding the Monkton coke ovens, which are to be extended.

Governors

The number of governors controlling gas from the intermediate pressure mains amounts now to 70, these being primarily of the mercurial type, although we have some diaphragm governors supplying industrial consumers direct. I much prefer that a governor, even when fitted specially to supply an industrial consumer, should be connected into the low pressure network. This not only assists the low pressure mains in the vicinity but gives much greater security to the industrial supply, as it prevents failure in the event of the governor sticking and prevents a build-up in the pressure if the governor fails to seat properly.

With 70 governors from the intermediate system, an additional 20 from the high pressure system, and the multiple outlets of eight works and holder stations, regular attention to district pressures is essential. Seventy permanent recorders are fitted on the district and charts from these are examined weekly. It will be appreciated that a build-up in night pressure is not always easy to find. Although sometimes we can name an offending governor at once, more usually we require to compare charts in detail with careful attention to altitude, and perhaps turn off several governors in turn before identifying the offender. This work is straightforward enough when only one governor is concerned, but when two or more are failing to seat tightly the possible combinations begin to multiply.

While our high pressure governors are fixed in a brick house, the mercurial governors are fitted in pits in the pavement or the roadway. This method has a great advantage, apart from the question of cost. It is not easy to obtain suitable sites for governor houses and the use of underground chambers avoids a great deal of searching and negotiation. The chamber has, of course, a disadvantage in that servicing is more difficult.

A standard brick house for the Reynolds governors, which control gas for the high pressure mains, has recently been designed using glass bricks in place of ordinary windows. I wish I could report that we had succeeded in avoiding breakages. The governor house is kept under 600 cu.ft. in volume to avoid restriction under the Town Planning Act, and ventilation is provided on each end wall.

Control

It would appear to be quite reasonable to state that such a complex system could not be worked without some form of central control room, except that it has in fact operated for many years without one and continues to do so. This is not to say that central control is not exercised. The advantages of central control are many, and it has been largely the desire to get on top of works and distribution problems first that has put the provision of a fully equipped control room into the background of our minds. It is, too, of great advantage to postpone the scheme until the main outlines of development have been completed.

For normal day-to-day operation, production figures are collated by telephone, but the district governors operate on a pre-determined schedule, this schedule being checked by a weekly study of district charts. Charts are fixed to the inlet and outlet of all high pressure governors and at key points on both the intermediate pressure network and the general low pressure system. One automatic unit is, however, used to signal back the terminal pressure on the high pressure line, from Annitsford in the extreme north of the division back to the compressor house at the Elswick works.

We have found a very useful substitute for a control room in the use of radio-equipped emergency vans. These vans are equipped with sending and receiving equipment and can talk to the radio-telephony room at Market Street or to each of the other vans. These vans had been introduced for the quick handling of emergency complaints and have proved very successful indeed from this point of view, but they have proved of exceptional value in this role of emergency control room where unusual district operations are being being carried out.

It has been necessary this summer to place St. Anthony's holder out of commission for some months and supply the large and congested area surrounding the 5 mill. holder directly from the intermediate pressure main. An additional 24 in. governor feeding from the intermediate pressure main to the 30 in. outlet from St. Anthony's has been fitted and the vans were used to determine the pressure position upon the district and the pressure conditions required at the fans at Redheugh works before and during the turning off of the holder. The crucial period is the Sunday peak load, but it was also necessary to determine the pressures it was necessary to carry at the boosters throughout the 24 hours.

Without a central control room with detailed information of pressures and flow at its disposal, the collecting of the information required would entail a detailed study of pressure charts following each adjustment to either the boosters or the governors. In the normal way this would have taken several weeks. With the use of the radio equipped van, it was possible to make adjustments to the boosters and governors and check the result at any point on the district within a matter of minutes.

In practice four vans were used and the information supplied to the radio room at Market Street was used as a basis for adjusting boosters and governors and the result of such adjustments upon the district pressures was immediately transmitted back to the radio room.

The vans have also been used in a similar manner when large trunk mains have been isolated, or the high pressure main over any section has been taken out of commission. The man turning off or bagging off a man has had a radio van beside him in conjunction with a similar van placed at the adjacent governor which is being used to reinforce the supply. The use of these vans in this way only serves to

underline the great advantages of a central control room, with continuous information of district conditions, not to mention the advantages from a production point of view of having an up-to-the-minute picture.

The radio vans have one great advantage. Being mobile they can be sent to any part of the district or to any works and not only transmit such information as may be required, but can carry out instructions given to them, based upon such information.

Summarising, dealing with much larger quantities of gas with an existing system has meant an undesirable increase in pressure. We are meeting this by converting some of our trunk mains to carry intermediate pressures, but at the same time we are examining the problem of the effect of increasing pressures upon meters from, I think, a somewhat unusual angle.

DISCUSSION

Mr. T. H. Fryer (Darlington) said that Le Fevre had aptly described the distribution side of gas engineering as 'the transport command of the gas industry, the life line without which all the efforts of the production engineer to make gas of good quality at low price and all the efforts of the service and commercial staff to provide well designed appliances and a cheap and effective service to consumers would come to nought.' The object of the paper by Mr. Brown was to show the problems connected with the efforts made and the means taken to cope with a large distribution system having to carry on 100% plus overload in the most economical manner.

It was worth reflecting upon present distribution practice in an endeavour to appreciate the current trend. Distribution pressures had been continually raised from 1 in. W.G. when loads were largely for lighting purposes and industrial uses, such as gas engines. The upright incandescent burner was then inverted and gas cooking and heating became popular, bringing in the widespread use of the bunsen burner and resulting in increased distribution pressures ranging up to 7 in. and 8 in. W.G. becoming necessary in order to obtain flame stability when meeting peak loads.

The tendency today to develop and exploit the greater use of neat flame burners could have a marked effect on this problem, and as most of domestic use of gas today was, or could be, dependent upon the heat content of the gas rather than the flame temperature, he would agree that flame temperature was often necessary in industrial processes. Here, however, greater use could be made of gas-air automatic proportioning or premix gas-air systems.

Then again, most of their domestic appliances were still functioning at 40-50% thermal efficiency, meaning they were having to provide some 20 cu.ft. of gas, of which 10 cu.ft. was usefully employed. Surely there was a case here for intensive research in order to improve these thermal efficiencies, especially with the present-day need to conserve fuel resources. He suggested that the modern method of pressure cooking and heat storage cooking pointed the way. If these improvements could be effected, the present yardstick of progress—that of increased sales—would need to be substituted by one denoting greater efficiency of utilisation. From these general observations he could not agree with the author's contention that they should aim at a differential pressure of 2 in. W.G., as this could represent a 50% pressure drop in the case of, say, 4 in. W.G. district pressure, which drop would furnish grounds for consumer complaints.

The problem of slow registration of consumers' meters demanded serious consideration. While appreciating its ingenuity, he did not like the suggestion of promoting shrinkage of diaphragm leathers by the application of dye, especially as the shrinkage appeared to be progressive. They must remember they were dealing with a statutory measuring instrument. He could confirm from tests made that there was a tendency to accentuate slowness as pressures increased, having obtained figures almost identical to those given in the paper. A check on their records revealed that in 1940 over a six-month testing period, some 40% of the meters tested were found to be slow and 16% fast, while over a similar period in 1952, with approximately the same number of meters, 42% were found to be slow and 50% fast. These meters were brought from the district for various reasons, and while they might not be strictly comparable with the author's figures, they did not tend to support his contention. He would suggest two other possible causes for his results:—

(1) A greater amount of dust carried forward to the meters by reason of increased pressures in the feeder mains.

(2) Creeping or the tendency of meters to pass unregistered gas at low rates of flow.

Another point worth mentioning was that of increased speed of working from some 300 up to 1,000 revs. per hour. He believed this was one of the chief contributory factors leading to inaccuracy of registration.

The existing construction of interlink works mains functioning at medium high pressure appeared to have enabled the author to extend this method of mains construction to a difficult area of supply comprising some densely populated together with some widely scattered districts, and this type of distribution system had already proved effective and economically sound in London and Liverpool, among other places. Nevertheless, there remained the alternative method of converting the whole mains system to medium high pressure. After all, the mains and services were capable of withstanding pressures some 400-500 times greater than those commonly used. This would mean providing service governors for each consumer, but providing a good simple reliable governor were employed, situated in footpath on the service, or access provided for maintenance and adjustment, this system had the merit of applying pressure control at the point of usage. The method had, of course, been employed with satisfactory results and there could be few of them who had not at one time or another employed it in carrying an extending district as a temporary measure while a normal system was developed.

When referring to the Gateshead main, the author stated that this area, with a population of 115,000, was too large to consider in terms of high pressure. He could not appreciate this, as there must be numerous towns around this size that had this system of supply. As their chief difficulties arose through having to meet peak demands, together with load factor and diversity of demand, surely the flexibility of a high pressure mains grid formed an ideal medium for meeting these conditions. They were completing construction of an industrial high pressure mains system the total peak loading of which was expected to be some 200,000-300,000 cu.ft. per hour, and considered that the flexibility this main allowed by utilising increased pressures to meet increased demands formed one of its chief advantages.

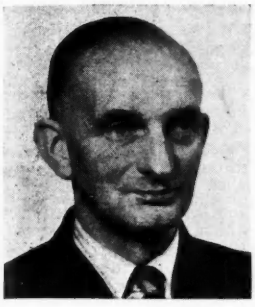
Higher Pressures Inevitable

Mr. G. E. Haddon (Stockton-on-Tees) thought they must accept higher mains pressures as inevitable—up to a maximum of ± 8½ in. W.G. A maximum variation of ± 2 in. W.G. mains pressure between one immediate step of pressure conditions and the next was reasonable and practical. He agreed that with ever-increasing outputs an examination of existing low pressure trunk and feeder mains should be made with a view to possible conversions to intermediate pressures. High pressure gas was expensive, but its use was now accepted and it was playing an important part in many distribution systems.

Mr. Stanley Jones (Middlesbrough) remarked that the author referred to the tendency of meters to give a slow registration when operating under increased pressures. It should be noted that an increase in pressure of 4 in. W.G. would effect a reduction of 1% in volume. On the figures quoted, an increase in pressure from 2 in. to 5 in. W.G. would account for an apparent increase in low registration of the meter from 0.8% to 1.5% and from 2 in. to 7 in. from 0.8% to 2.13%, which figures approximated closely to the observations made by Mr. Brown. Presumably allowance would have been made for this factor when carrying out the tests.

In regard to Mr. Brown's remarks about meter leather dressing, it was very disturbing to learn that leather shrinkage might account for a substantial proportion of unaccounted-for gas. Notwithstanding this, however, means whereby leathers could be deliberately shrunk *in situ* on the district by spraying oil impregnated with a substance which caused shrinkage he feared could easily be abused, and the use of such substances by gas undertakings would not be readily sanctioned. On the other hand, the use of these substances by the meter manufacturers so as to counteract any possible shrinkage would be most desirable.

(*Concluded on p. 56*)



F. E. Mills

Effects of Iron Carbonyl in Gas

By

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Introduction and discussion of the paper at the Research Meeting of the Institution of Gas Engineers, 1952

MR. W. J. GOODERHAM, presenting the paper, said it was really a scientific tit-bit, which in filmland might have been entitled 'The Childerditch Story.' It was concerned with the strange happenings at Childerditch following the kindly and paternal action of the North Thames Gas Board in connecting a few houses to a new gas main. The gas main had, however, a blocked end, and because it was a long and large main, the gas stayed in it a long time. After some months, the consumers at Childerditch complained of sooty deposits everywhere. It subsequently transpired that iron carbonyl had been formed in the main. Iron carbonyl decomposed readily at temperatures above 250°C. to iron and carbon monoxide, and it soon became apparent that when the gas containing quite a small amount of iron carbonyl was used in an appliance, an iron 'mirror' was deposited in the hot part of a burner throat or on the bottom of a kettle or saucepan, and the hot mirror so formed catalysed the decomposition of certain substances in the gas so that heavy soot-like deposits were formed. A particularly annoying feature of these phenomena was the fact that after the consumers had cleaned off the deposits, the mirror remained and was thus able to form soot, at least for some time afterwards.

The catalytic effect was proved by the following experiment. Normal district gas at Fulham, containing no iron carbonyl, was passed at 233 ml. per min. through a Pyrex tube at 480°C. for some hours. There was no deposit at all. The temperature of the tube was then lowered to 280°C. and 284 ml. of the Childerditch gas passed through it to give a mirror. The temperature was brought back to 480°C. and 3,000 ml. of Fulham district gas passed through in 15 min. A deposit of carbon was then obtained, but only on the previously formed mirror, although those parts of the tube before and after the mirror were also at 480°C. This experiment showed conclusively that the mirror catalysed the deposition of carbon from gas which, hitherto, had produced no deposits.

A Chastening Fact

After these occurrences at Childerditch were traced back to iron carbonyl, a study of the literature revealed the chastening fact that Rosco and Scudder had shown the presence of iron carbonyl in water gas as long ago as 1891, in fact, only one year after the original and famous discovery of the chemical existence of the carbonyls. Further study produced the summary given in the paper.

An attempt was made to 'kill' the strangely active iron surfaces in the main by chemical treatment with sulphur dioxide. Two teams of workers with cars, lorries, and attendant acolytes had a great day out when the main was purged from Brentwood to Rayleigh. Sulphur dioxide was added at one point and tested for at the next point along the main with a delicate colorimetric test. In the first section of the main, sulphur dioxide came through so quickly that after adding it at one point no car was found capable of arriving at the next point before the sulphur dioxide. In the second half of the main, nearer the blow-offs, the second team of workers did not have anything like so hectic a rush. It would appear that this attempt at sterilising a rather special main had been quite a success.

Sir Alfred Egerton (Imperial College) said there was no doubt that carbon monoxide reacted at ordinary temperature under pressure with iron. It would be interesting to hear more about the conditions which governed the rate of formation, the influence of other substances, such as hydrogen and inhibitors, such as SO_2, which appeared to inhibit, though that might only be an action on the metal.

Some years ago, in 1938, they made a number of experiments on the effect of additives on gas flames. Among them was iron carbonyl. They had similar results to those which were described in the Paper. Since then extensive work had been done by Gaydon on the behaviour of iron carbonyl in flames at low pressures. Recently at Imperial College they had been working on the decomposition of peroxides by metal carbonyls and other organic substances. The region of decomposition and mode of decomposition of such substances in various diffusion flames had been studied. The effect of iron carbonyl on the velocity of flames was interesting. Such additions had little effect on the lower limit in small quantities or on the velocity of mixtures in the lower limit, but higher concentrations had a definite catalytic effect, and particularly with richer flames.

Deposit on Gas Mantles

Mr. H. H. Brown (South Western Gas Board) said his interest in the effect of traces of iron carbonyl in town gas dated back to 30 years ago when he investigated phenomena similar to those described in the paper under discussion. The amount of iron carbonyl present in the gas (which gave rise to the darkening of gas mantles) was considerably less than the amounts found in the gas on the supply system in Essex, and was calculated back from the actual deposit of iron found on the mantles concerned and consequently resulted in a figure of something which was less than that actually present in the gas, the total amount present being insufficient to cause the phenomenon of a soot deposit as described in the paper. The method of estimation used was: (1) Solution of the iron oxide in hydrochloric acid, and (2) colour matching on reaction with ammonium thiocyanate.

Volatile compounds of iron had been associated with carburetted water gas over a long period, and he would like to instance the undoubted fact that the wooden supports of purifier covers in boxes used over many years to purify carburetted water gas showed impregnation to a remarkable degree and offcuts of wood, taken from the lids of purifiers, which had been continually exposed to carburetted water gas, when burned to ashes, showed so much iron that they resembled the fine preparation of iron oxide used for red oxide paint.

The authors had not made any particular reference to the proportion of carbon monoxide present in the gas. His analysis of gas at Southampton containing iron carbonyl showed that the carbon monoxide was in excess of 20%, and another interesting feature was the complete absence of oxygen in the contaminated gas.

He was interested in the treatment to which the gas mains were subjected in order to prevent the continual production of iron carbonyl, but the cure in the circumstances arising at Southampton, of spraying paraffin into the mains, seemed to deal with the matter satisfactorily, and he assumed it was more convenient than the method used to deal with the situation in Essex.

The obvious conclusion to be drawn from the paper regarding the cause of the production of iron carbonyl was con-

sistent with his observations at Southampton—namely, that a new uncontaminated surface of iron, either as cast iron or steel, with a long time contact, was necessary to produce iron carbonyl, and his suggestion that any operation which could successfully coat the active iron within the main, either chemically or physically, was a sufficent cure provided always that a quick purge was made at the same time the sealing of the iron surface was effected.

Regarding the discoloration of gas fire radiants, while there could be no doubt that the presence of substantial quantities of iron carbonyl in gas could, and did, in fact, produce the discoloration of the radiants, and, as the authors showed, in certain circumstances acted as a catalyst in throwing down precipitated carbon, he believed that quite a lot of discoloration of gas fire radiants was due to the fixation of the solid matter contained in dust carried forward in the indrawn air and fixed by the flames on the radiants.

It was fortunate that iron carbonyl contamination did not happen more frequently. The extension of mains in an integration development to isolated consumers taking gas for the first time from new mains in small quantities relative to the surface of iron exposed to the gas was, however, likely to bring this phenomenon more frequently to the notice of engineers, and he suggested that the better way to deal with the situation would be to spray the mains with vaporising oils or paraffin.

Mr. Norman Calvert (East Midlands Gas Board) said that in 1937 Nottingham was supplied with gas from two manufacturing stations. At both stations the carbonising plant was upwardly heated W.-D. continuous vertical retorts, but at Basford the retorts were 76 in. and at Eastcroft 103 in. There was no C.W.G. at either works. After half the retorts at Eastcroft had been let down for repair, they were put to work in October, 1937. Soon afterwards complaints began to be received from the district of 'sooting up' of gas burners, which first caused distortion of the gas flames and eventually completely choked the burners in central heating appliances. Prior to these retorts being put to work, no trouble of this type had been experienced on the district, and during this period the districts supplied by Basford were free from such trouble. Both Basford and Eastcroft were carbonising the same coals, and neither stripped for benzole or naphthalene.

It was finally agreed that the trouble was due to some form of hydrocarbon peculiar to Eastcroft gas. This trouble could be largely overcome by:—

(1) Stripping the gas by freezing or activated charcoal.
(2) Washing the gas with oil or light tar.
(3) Reducing the retort coal throughputs below 9.3 tons per retort per day.

The reduction in throughput was the simplest and quickest immediate remedy. This was put into practice. An addition of Yorkshire coal to the mixture of Notts and Derby coals then in use at Eastcroft helped to dispel the trouble. Slowly these retorts were put back to their rated throughputs and the trouble did not re-appear.

Dr. R. Lessing said that during the last war, some trouble arose at Nesscliffe Camp from gas which had been compressed into cylinders by Wallasey gasworks. He suggested that the trouble arose from iron carbonyl—which in fact was the case. There were various methods by which nickel carbonyl could be removed from gas, and in fact he proposed these in the particular case at Nesscliffe Camp. It was a question of either extracting or scrubbing it out with an oil solvent, which was relatively simple, or of absorption by active carbon.

Dr. R. H. Griffith (London Research Station, Gas Council) said that in 1938, when they were starting up the catalytic sulphur removal plant at Harow, they had a rather similar experience with nickel carbonyl. At that time they had not learned how to make the nickel sulphite catalyst directly to nickel sulphate, and we went through the metal stage. As they were also novices in the art of running such a plant, they started it up rather cautiously, and as they sat on in the late evening and watched the temperature slowly rise, they began to look at one another and think, 'Is there something wrong with my eyes, or are the lights burning dim?' In fact, they were burning dim, and before the night was out every gas mantle in Harrow works gave nothing but a dull red glow. The next day every gas mantle in Harrow had to be replaced. Similar effects occurred on the gas fire radiants. So there was a very close parallel between the behaviour of nickel carbonyl and iron carbonyl.

But when they looked at other materials which affected flame structure and combustion characteristics it was interesting to record that tetra-ethyl lead had not effects resembling those of nickel carbonyl or iron carbonyl, although in other fields the behaviour of iron carbonyl was very similar to that of tetra-ethyl lead. For example, before the war iron carbonyl was added to the synthetic petrol which was sold in Germany as an anti-knock.

DISTRIBUTION WITH AN EXPANDING LOAD—Concluded from page 50.

Turning to the internal coating of steel pipes with red lead, he was in full agreement with this practice, but it had been brought to his notice recently that Newcastle also made a practice of coating cast iron pipes internally with red lead. He would question the justification of this procedure, particularly as he found that the cost of this internal coating was equal to an increase of 13% on the cost of the pipe. Their experience at Middlesbrough was that internal coating of cast iron pipes was unnecessary, with or without gas dehydration.

Mr. B. Richardson said he was interested in that portion of Mr. Brown's paper which dealt with the effect of coal-tar dyes on leather. The process of tanning depended in brief, on the fact that when infusion of nut galls was added to gelatine the latter combined with the tannic acid of the galls and a bulky precipitate resulted. If a piece of skin which had the same composition as gelatine was placed in the infusion of nut gall or oak bark, it would absorb the whole of the tannic acid and become converted into leather, which was much tougher than the raw skins, less permeable to water, and not liable to putrefaction. Salts of iron, aluminium, and chromium were also capable of tanning hides and producing leather, chrome leather in particular possessing valuable properties, especially as regards resistance to hot and cold water. This fact justified the use of expensive chromium salts. They thus had tannic acid on the one hand and basic chromium salts on the other combining with gelatine to form similar insoluble compounds. Although he had no precise information on the matter, he believed that shrinkage of the leather in the presence of a coal-tar dye, referred to by Mr. Brown, might be explained by assuming the formation, first, of a soluble additive compound of the leather and the dye, which then dissolved in the excess of dye solution.

Mr. Brown, replying to the discussion, agreed with Mr. Haddon that they must accept higher mains pressures as inevitable under present conditions, but a figure of 2 in. W.G. between their lowest and highest pressures in an area did give them a target at which to aim. The economic working pressure for any main could only be determined by taking into account the length of main, volume, times of pumping, and so on, each case being treated on its merits. Their high pressure system at present worked up to 30 lb. In regard to the point raised by Mr. Jones, meters were tested at the different pressures by varying the pressure in the test holder. The difference in pressure between the holder and at the meter was therefore negligible, being the pressure loss of the connections. He agreed with Mr. Jones that the most practical value of the dye would be to incorporate it in the original dressing of the leather, if this was found to be a practicable proposition. His whole point was that an investigation on this question of diaphragm shrinkage was well worth-while. Newcastle had used red lead as an external coating for some 20 years and he had no doubt at all that it had proved its value.

He was glad to have the confirmation of Mr. Fryer regarding the increasing slowness of meters over recent years. All meters did not appear to be affected in the same way, and while a few of their meters ran fast, the great majority tended to run slow shortly after being placed upon the district. He agreed that there was a tendency to pass unregistered gas at low rates of flow, particularly with the increasing number of by-passes now in use.

Mr. Fryer's suggestion to raise the whole mains system to medium high pressure was interesting, but they had to bear in mind that the greater part of their system was many years old and had open lead joints. He thought it was far preferable to use an intermediate high pressure system entirely separate from the general network but governing into it wherever reinforcement was required. A further point in favour of such a course was the expense of providing in an area the size of the Newcastle division some 300,000 service governors, with not only a very high capital cost but the problem of continuous maintenance.

TRADE NEWS

Goodenough Pumps

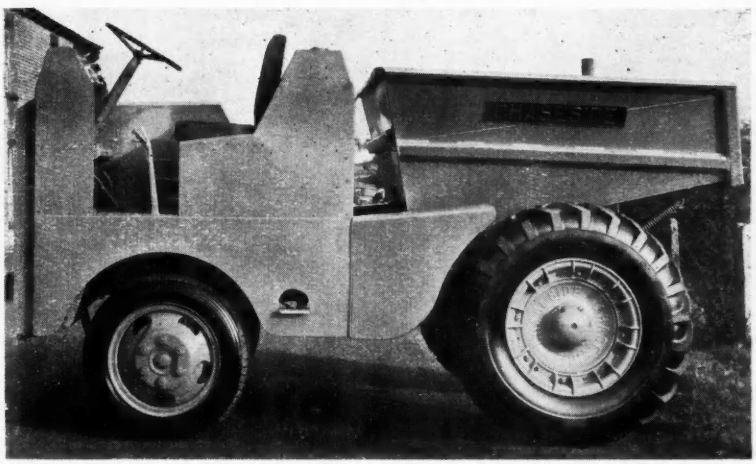
THE latest addition to the range of Goodenough portable pumps is the 6 in. automatic self-priming centrifugal pump. This pump has been designed for the use of civil engineers and public works contractors, and is intended to overcome the obstacles normally associated with large size pumps—*viz.*, the difficulty in transportation, and the handling of the unit on sites. The pump and engine are mounted on a towing trailer equipped with over-run brakes, making the unit extremely mobile. The new pump has a high capacity, the maximum output being 75,000 gal. per hour, a guaranteed suction lift of 25 ft., and a maximum total head of 100 ft. The engine fitted is an Armstrong Siddeley diesel developing 20 h.p. The pump will handle water containing a high percentage of abrasive matter, including solids up to 25%, liquid mud, sewage sludge, oil and petrol, chemicals, etc. *Goodenough Contractors' Machinery, Ltd., 70/72, London Road, Twickenham.*

Borax Consolidated

'BORAXO' ('Braxo'), a powder hand cleanser developed by Borax Consolidated, Ltd., introduces new principles in hand cleaning. The product contains no insoluble or abrasive fillers and the scouring action necessary to remove ingrained dirt, or to penetrate oily films, is provided by the small grains of borax, which slowly dissolve during the wash. 'Boraxo' in water solution is mildly alkaline—much less so than soaps in general. It has a *p*H value of 9.3 which is claimed to be sufficiently low to ensure no chemical damage to the skin and to prevent undue removal of natural fats.

'Boraxo' is designed principally for use in industry and is a boon to mechanics working in foundries, engineering shops, garages, coal mines, gasworks, and in a host of factories in which clean hands are an essential to successful processing. A working sample will be sent, on request, by *Borax Consolidated, Ltd., Regis House, King William Street, London, E.C.4.*

Chaseside Engineering



THE new Chaseside dumper illustrated here has been designed to incorporate all the best features of the Chaseside 'Hi-Speed' dumper together with a number of important improvements. This new 3 cu. yd. dumper will carry its pay load with a considerable margin of safety at maximum speed over almost any type of ground surface. This is made possible by the exceptionally wide track of the driving axle and low centre of gravity coupled with excellent ground clearance. The new Chaseside dumper, available only with diesel engine, will be offered with the conventional dumper driving position or with 'forward drive' so that it may be licenced for the road.

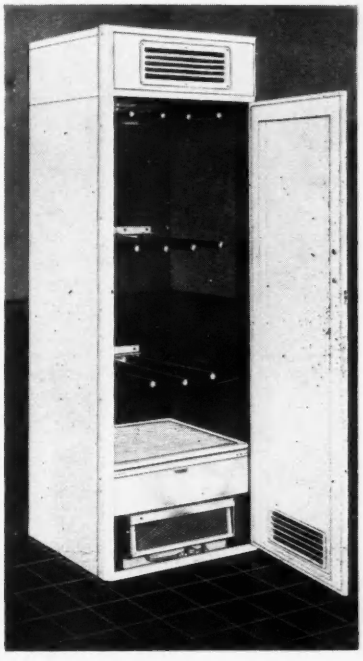
A further interesting feature of this machine is the new type steering axle which, eliminating the use of radius rods, assists in providing the machine with its ground clearance.

POWERS-SAMAS ACCOUNTING MACHINES, manufacturers of punched-card accounting equipment, are to enter the Italian market. An agreement has been signed between the company and Società Macchine Contabli Lagomarsino of Milan, under which the latter becomes responsible for the sale throughout Italy of the Powers-Samas Company's products.

KENT NORLANTIC, LTD.—A company has been formed and has commenced operations in Canada under the title of Kent-Norlantic, Ltd., at Horner Avenue, Toronto 14. This organisation takes over from the parent company, George Kent, Ltd., the responsibility of marketing, throughout Canada, Kent industrial instruments, and the Norlantic range of domestic and industrial meters.

Clifford Products

THE new 'Clifford' clothes drying and airing cabinet is offered at a price which brings this item of domestic equipment within the reach of every householder. Though conventional in appearance, the appliance is designed on somewhat unorthodox principles. It consists primarily of an efficient gas-fired drying unit while the remainder of the component parts—*i.e.*, front frame and door, set of 11 hanging rods, side panel (right or left hand), and top panel—are supplied as required, according to the position in which the appliance is to be installed.



It is envisaged that gas boards would stock the various components in their unassembled state—thus eliminating the problem of bulk storage and transport—and assemble them on site as required. In existing buildings the appliance would normally be installed in a corner of the kitchen or bathroom, the 90° angle of wall forming one side and the back of the cabinet.

In new housing schemes and particularly in flats where clothes drying presents a major difficulty, the architects' profession will realise the advantages of providing a suitable recess which will require only the 'Clifford' front frame and door unit to complete the cabinet structure. No special flues are necessary as the air-inlet and outlet grilles are built into the door itself.

Assembly is easy and rapid by means of nuts and bolts, and the sheet steel panels are treated with a special rust-preventative. There is no danger of iron-mould marks from the hanging rods which are of extruded plastic, and those parts of the appliance liable to frequent contact with moisture are made from non-rusting alloys.—*Clifford Products, Ltd., Imperial Works, Wednesbury, Staffs.*